RESTRICTED

INSTRUCTION BOOK

NAVY MODEL TCP-3 TRANSMITTING-RECEIVING RADIOTELEPHONE EQUIPMENT

TYPE OF EMISSION
TELEPHONE (A3)

FREQUENCY RANGE
2,000 to 3,000 KC.

NOMINAL POWER OUTPUT
75 WATTS PHONE (A3)

Manufactured for U. S. Navy Department, Bureau of Ships
By

RADIOMARINE CORPORATION OF AMERICA

75 VARICK STREET, NEW YORK 13, N. Y.

CONTRACT NXsr-55686

DATE OF CONTRACT APRIL 19, 1944

November 1944

CONTRACTUAL GUARANTEE

GUARANTEE: ONE YEAR

The equipment including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its service life, shall be made to the Bureau of Engineering in accordance with current instructions. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 31, (Mimeographed Form) of the Manual of Engineering Instruction, or the Bureau of Ships Radio and Sound Bulletin No. 7, dated July 1, 1942, or superseding instructions.

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CONTRACT NO. NXsr-55686 DATE OF CONTRACT APRIL 19, 1944

SERIAL NUMBER OF EQUIPMENT_____

DATE OF ACCEPTANCE BY THE NAVY_____

DATE OF DELIVERY TO CONTRACT DESTINATION_____

DATE OF COMPLETION OF INSTALLATION _____

DATE PLACED IN SERVICE _____

BLANK SPACES IN THIS BOOK SHALL BE FILLED IN AT TIME OF INSTALLATION. OPERATING PERSONNEL SHALL ALSO MARK "DATE PLACED IN SERVICE" ON THE DATE PLATE LOCATED BELOW THE MODEL NAMEPLATE ON THE EQUIPMENT, USING SUITABLE METHODS AND CARE TO AVOID DAMAGING THE EQUIPMENT.

TO EXPEDITE THE PROCUREMENT OF REPLACEMENT PARTS, ALL REQUESTS FOR REPLACEMENT MATERIAL SHOULD INCLUDE COMPLETE DESCRIPTIVE DATA COVERING THE PART DESIRED, IN THE FOLLOWING FORM: -

1. NAME OF PART DESIRED
2. NAVY TYPE NUMBER(IF ASSIGNED)(INCLUDING PREFIX AND SUFFIX AS APPLICABLE.)
3. MODEL DESIGNATION (INCLUDING SUFFIX) OF EQUIPMENT IN WHICH USED.
4. NAVY TYPE DESIGNATION (INCLUDING PREFIX AND SUFFIX WHERE APPLICABLE) OF MAJOR UNIT IN WHICH PART IS USED.
5. SYMBOL DESIGNATION OF PART.
6. (a) - NAVY DRAWING NUMBER

   (b) - MANUFACTURER'S DRAWING NUMBER
7. RATING OR OTHER DESCRIPTIVE DATA.
8. COMMERCIAL DESIGNATION.

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INSTRUCTION BOOK
MODEL TCP-3
TRANSMITTING - RECEIVING
RADIOTELEPHONE EQUIPMENT

1 - GENERAL DESCRIPTION

1.1 - Application: The model TCP-3 radiotelephone equipment comprises a compact medium power radiotelephone transmitter and receiver, designed for installation aboard vessels of the United States Navy. Radio personnel are urged to study carefully the instructions contained in this book so that the equipment may be installed, adjusted, operated and maintained for maximum performance.

1.2 - Component Units: The component units furnished for each installation (for various power supplies) normally comprise the following items: (See Table I)

1 Transmitter-Receiver Unit
- CRM-43009-A for 32 Volts D.C.
- CRM-43010-A for 115 Volts D.C.
- CRM-43061 for 230 Volts D.C.
- CRM-43062 for 115 Volts, 1 Phase, 50/60 Cycles

1 Line Filter Unit
- CRM-53085 for 32 Volts D.C.
- CRM-53086 for 115 Volts D.C.
- CRM-53192 for 230 Volts D.C.

1 Hand Telephone Assembly (CRM-51026

1 Remote Control Unit (CRM-23230)

1 Set of Vacuum Tubes Comprising: (18 Total for D.C.Equipment)
(20 Total for A.C.Equipment)

5 - 807	2 - 809
3 - 6A6	4 - 6L7
1 - 6J5	1 - 6R7
1 - 6V6GT/G	1 - 5W4

2 - 866A/866 (for 115 V, 1 Ph., 50/60 Cycles only)

1 Set of Type R1 Transmitter Crystals)
) As Called For
1 Set of Type R1 Receiver Crystals) By Contract.

2 Metal Spare Parts Box per Navy Spec 42-B-9 (INT)

1 Set of Spare Parts (As Called For By Contract)

2 Instruction Books

1.3 - Power Output: The radio transmitter is designed to deliver 75 watts of carrier power into a typical 16 ohm, 200 mmfd. antenna. The modulation capability is substantially 100 percent.

1.4 - Frequency Range: The transmitter and receiver are designed to cover the frequency range of 2000 to 3000 K.C. There is provision for the use of a maximum of ten frequencies within this band. The exact number of frequencies supplied on a particular order are as specified on that order.

1.5 - Frequency Control: Type R1 transmitter and receiver Quartz crystals are used in the equipment. Crystals are of the plug-in type with .850 inch pin spacing. A crystal jack board marked "T" provides mounting for ten transmitter crystals, and a similar jack board marked "R" provides mounting for ten receiver crystals. Crystals are of the low temperature coefficient type (approximately 3 cycles per M.C. per degree C), and are ground for an operating tolerance of plus or minus .04 percent. Transmitter crystals are ground directly for the desired transmitting frequency, that is, the frequency on the nameplate is the same as the output frequency. In the case of receiver crystals, such crystals are ground for a frequency 455 K.C. higher or lower than the frequency of the signal to be received. Under present frequency assignments, the frequency of the receiver crystals always end with an "odd" digit, such as 1, 3, 5, 7 or 9. To identify a receiver crystal, so that it may be paired up with the corresponding transmitter crystal, add or subtract the number 455 from the frequency on the receiver crystal nameplate. Either the sum or the difference will then equal the frequency of the signal to be received. When the equipment is used for communication with U. S. Coastal Harbor Stations, which transmit and receive on different frequencies, refer to the list in this book for such Coastal Harbor Stations to determine the correct transmitter and receiver crystal frequencies.

1.6 - Remote Control Unit: The remote control unit is used when it is desired to operate the equipment from a remote point after the desired frequency has been selected at the transmitter-receiver unit. The remote control unit may, therefore, be considered as an accessory, as it is not required when the equipment is to be operated directly from the transmitter-receiver unit. *Two 7 conductor cables are needed to the remote unit to provide a total of 14 conductors.

1.7 - Selective Ringer: The radiotelephone equipment is designed so that, at a future date, a suitable type of selective ringer may be added. The purpose of this selective ringer is to enable a local Coastal Harbor Station to ring a bell aboard the ship on which the radiotelephone equipment is installed.

1.8 - Vacuum Tubes: The radio transmitter employs ten vacuum tubes as follows:

1 - 807 Crystal Controlled Oscillator
4 - 807 Power Amplifiers
2 - 809 Modulators
1 - 6A6 Driver Audio Amplifier
1 - 6A6 Microphone Audio Amplifier
1 - 6A6 Vodas Audio Rectifier
2 - 866A/866 Rectifiers (115 Volt A.C. Equipment Only)

* One each 1-7/16" knockout is provided at the lower left rear corner of the transmitter-receiver cabinet and on the remote control unit of model TCP-3 equipments to allow use of Navy type MHFA-19 cable to interconnect these units.

The radio receiver employs eight vacuum tubes as follows:

1 - 6L7 R. F. Amplifier
1 - 6L7 Converter
2 - 6L7 Intermediate Amplifiers
1 - 6J5 Crystal Controlled R. F. Oscillator
1 - 6R7 Second Detector - First Audio Amplifier
1 - 6V6GT/G Second Audio Amplifier
1 - 5W4 Power Rectifier

A socket for an additional 6J5 "ringer audio amplifier" tube is provided in the receiver for special installations which are furnished with an automatic bell ringing device.

1.9 - Transmitter-Receiver Unit Construction: Refer to KS-12 and the photographs in this book. The overall mechanical assembly is constructed with an aluminum frame with removable front, side, rear and top panels. The receiver unit itself is constructed on a separate chassis and arranged so that the receiver chassis and its front panel may be conveniently removed from the front of the cabinet. Four heavy duty rubber shock mounts are fastened to the base of the unit, and an additional rear bracket is furnished to brace the unit against an adjoining bulkhead.

1.10 - Transmitter-Receiver Unit Panel Controls: Two meters are provided in the upper section of the front panel, one of which reads antenna current and the other various tube currents as determined by the "current" switch beneath that meter.

(a) The antenna circuit is tuned by means of a continuously variable rotating coil which is adjusted by means of the control between the two meters.

(b) A "Trans" ten position switch mounted below the antenna ammeter is used to adjust the oscillator and power amplifier circuits of the radio transmitter to the desired transmitting frequency.

(c) A "Press-Talk - Automatic" switch is provided to control certain circuit functions as described further in this book. A small green pilot light "Transmitter On" is illuminated when the handset is removed from its support.

(d) The "Off-On" toggle switch on the front panel is used to turn the radio receiver off or on, and in the "On" position also permits the radio transmitter to be used whenever the handset is removed from its support.

(e) The various controls for the radio receiver are mounted in the center section of the front panel. A built-in loud speaker is provided. Beneath the loud speaker, a red pilot light indicates when the receiver has been turned on. The radio receiver may be set to any one of the pre-tuned frequencies for which it has been adjusted

by means of the ten position "Recr" switch. Beneath the red "Receiver On" pilot light, there is mounted a toggle type "Volume Switch" which permits control of receiver volume (sensitivity) at either a local or remote position. To the left of this switch is mounted a local receiver "Volume Control".

(f) Frequency marker plates are mounted on the front panel, with provision for a maximum of ten plates, to indicate the positions to which the transmitter and receiver switches should be placed for the various frequencies. "Blank" plates are used for switch positions not provided with crystals.

(g) Access to the main terminal board, fuses, and the automatic starter for the transmitter motor generator unit, is obtained by removing the lower front panel section which is provided with thumb screws. Access to the radio receiver is accomplished by removing the screws of the receiver panel section and withdrawing the receiver chassis.

(h) A "Spkr-Handset" switch is provided so that either the loud speaker or the telephone receiver in the handset may be used for reception when operating under "Press-Talk" conditions. This "Spkr-Handset" switch must not be left in the speaker position when "automatic" operation is in use.

1.11 - Line Filter Unit: The line filter unit is a small external assembly mounted in a metal container for connection between the ship's power source and the transmitter-receiver unit. This unit, which contains radio frequency filters, a toggle type line switch and a fuse, is designed for installation near the transmitter-receiver unit and connects to that unit by means of the rubber covered, heavy duty cable which is a part of the transmitter-receiver unit. Refer to drawing KS-15 and Figure 10 in this book.

1.12 - Hand Telephone Assembly: The hand telephone assembly consists of a "Press-to-Talk" type of handset and a switch hook unit for supporting the handset. This assembly may be installed near the transmitter-receiver unit so that the user may manipulate the "Press-to-Talk" button on the handset as well as the various controls on the transmitter-receiver unit. A special rubber clamping device is provided on the hand telephone assembly so that the handset remains securely in place when not in use. Refer to drawing KS-14 and Figure 9 in this book.

1.13 - Remote Control Unit: The remote control unit is designed for installation in any convenient location. This control unit includes a handset, loud speaker, volume control, and a "Volume Switch". When this unit is used, it provides means for receiving calls or placing calls from the remote point. Installation of a remote control unit does not prevent "local" operation of the set, since it is only necessary to place the "Volume Switch" on the transmitter-receiver unit in the correct position when local operation is desired. When the remote control unit is used, it is, of course, necessary to place the transmitter-receiver switches in the

correct positions and to turn on the radio receiver at the transmitter-receiver unit and also to adjust the antenna tuning control. Provision is made in the remote control unit for future installation of a bell for special installations where an automatic ringing device is added to the radio receiver in the transmitter-receiver unit. See drawing KS-13 and Figure 11 in this book.

1.14 - Power Supply: Model TCP-3 is designed to operate from a D. C. power supply of 32, 115 or 230 volts. It is also designed to operate from 115 volts, 1 phase, 50/60 cycles, power supply. The D. C. power supply equipments use appropriate line filter units as listed in paragraph 1.2, and contain two rotating machines, one a rotary converter for the radio receiver and the other a motor generator for the radio transmitter. The A. C. power supply equipment has a built-in rectifier power unit which furnishes power for the radio transmitter. A receiver rotary converter is not necessary for the A. C. power supply equipment.

1.15 - The power supply requirements are approximately as follows:

Supply Voltage	Receiver "On" (Standby)	Two Way Communication Receiving	Two Way Communication Transmitting
32 V - D.C.	5.2 Amps	18	26
115 V - D.C.	1.4 Amps	6	8
230 V - D.C.	0.75 Amps	3	4
115 V, 1 Phase, 50/60 cycles	0.7 Amps	3	6

Two way communication (receiving) means handset off support and transmitter is ready to use. Two way communication (transmitting) means handset off support and push button closed to talk.

1.16 - Data on Converter and Motor Generator:

Receiver Rotary Converter

Input	Output	Type	
31 V - 5.2 Amps D.C.	115 V - .6 Amp 60 Cycle	AK-150	SS-3021
115 V - 1.5 Amps D.C.	115 V - .6 Amp 60 Cycle	AK-150	SS-3020
230 V - 0.75 Amps D.C.	115 V - .6 Amp 60 Cycle	AK-150	SS-3073

Converter is a 3600 RPM, ball bearing, enclosed machine, continuous duty, 40 degrees C rise, and has a built-in R. F. filter unit mounted underneath machine. Overall dimensions are 10 inches long, 9-1/4 inches high and 6-1/4 inches deep. Weight is 25 pounds.

Transmitter Motor Generator

Input	Output	Type
31 V - 20 Amps D.C.	550 V - .5 Amp D.C. 22 V - 4.55 Amps, 60 Cycles	ET-8012-B SS-2049
115 V - 5.5 Amps D.C.	550 V - .5 Amp D.C. 81 V - 1.23 Amps, 60 Cycles	ET-8012-D-115- -MG-242-B
230 V - 2.5 Amps D.C.	550 V - .5 Amp D.C. 162 V - .615 Amp, 60 Cycles	ET-8012-D-230- -MG-242-B

Motor generator is a 3600 RPM, ball bearing, enclosed machine, continuous duty, 40 degrees C rise. Overall dimensions are 17-1/2 inches long, 8-3/4 inches high and 10-1/2 inches deep. Weight is 82 pounds.

1.17 - Dimensions and Weights: The transmitter-receiver unit is 37" high, 20-1/8" wide and 22" deep. The weight is approximately 310 pounds.

The line filter unit is 10-9/16" high, 9-3/8" wide and 3-5/8" deep. The weight is 9 pounds.

The CRM-51026 hand telephone assembly is 9" high, 3-1/2" wide and 6-1/4" deep. The weight is 4 pounds.

The CRM-23230 remote control unit is 10-1/4" high, 13-5/8" wide and 5-3/8" deep. The weight is 11 pounds. (Dimensions include handset in position on control unit.)

2 - CONDENSED OPERATING INSTRUCTIONS

2.1 - A small instruction card 5-3/8" by 8-3/8" furnished with each equipment should be posted near the transmitter-receiver unit for use by operating personnel. This card contains the following instructions:

1. Place "Trans" and "Recr" switches in the correct positions for the desired frequency. Adjust P. A. Tuning to setting indicated on calibration chart. Place "Handset" switch in the "Press-Talk position. Place "Spkr-Handset" switch in "Spkr" position.

2. To Receive Calls: Turn "Off-On" switch to "On". "Receiver On" red light will glow. Adjust "Volume Control" clockwise to as high a value as possible. Incoming calls or atmospheric noise will be heard from loud speaker.

3. To Place Calls: Remove handset from support. "Transmitter On" green light will glow. Allow 15 seconds for tubes to warm up. Make sure P. A. Tuning is adjusted to correct setting. Press the button in the center of the handset and rotate antenna tuning control for maximum antenna current. While calling or talking, keep button depressed. Release button to hear the other party. Adjust "volume" to desired value.

4. Important: After completing two way conversation, replace handset on support and readjust "Volume Control" to a high enough value so that the next incoming call will be clearly heard.

5. Use of Remote Control Unit: Installations with a CRM-23230 Remote Control Unit require suitable adjustment of the "Volume Switch". This switch transfers the Volume Control circuits. To use the Remote Control Unit, place this "Volume" switch either to the right or left, the correct position being the one which permits the Volume Control Knob to regulate the sound from the loud speaker. If set is to be used "locally", follow same procedure with "Volume Switch" on transmitter-receiver unit.

6. To shut down set completely, turn off panel "Off-On" switch and note that red light is extinguished.

3 - ADDITIONAL OPERATING INSTRUCTIONS

3.1 - The "Trans" switch for the radio transmitter, simultaneously selects the appropriate transmitter circuits and transmitter crystal for the desired transmitting frequency. The "P. A. Tuning" control is the small knob mounted directly above the "Off-On" switch. This "P. A. Tuning" control should always be carefully adjusted to the calibrated setting as recorded in the small frame on the panel. If the correct setting is not known, it may be quickly determined by adjusting the knob for minimum P. A. cathode current as read on the plate current meter with the current switch in position 3, and with no antenna current. After this is done, the antenna circuit may be resonated for maximum antenna current.

3.2 - Under special conditions "cross channel" operation using "Navy" frequencies may be carried on with other vessels that are similarly equipped with model TCP series radiotelephones. In other words, since there are separate transmitter and receiver switches, it is possible to transmit on one frequency and receive on a different frequency, provided both parties make suitable arrangements. "Cross Channel" operation, however, cannot be carried on with coastal harbor stations, since a definite transmitting frequency and a definite receiving frequency must be used with each harbor station.

3.3 - Familiarity should be acquired with the adjustment of the antenna tuning control marked "Adjust for maximum antenna current". Whenever the transmitting frequency is changed, this control should always be readjusted for maximum antenna current. When changing to a higher frequency from the one previously in use, the knob should be rotated counterclockwise. If a lower frequency is selected, the knob should be rotated clockwise. The "current" switch beneath the plate current meter should always be left in position 3. The other positions of this switch are for

use in service and maintenance. TCP-3 equipment has Veeder-Root counter to assist in adjusting antenna tuning control. When all of the turns of the coil are in use (maximum inductance), the counter will read 1445. With the turns all out of circuit (minimum inductance), the counter will read 1000. In any case, however, it is recommended that the antenna tuning control be adjusted for maximum antenna current instead of depending upon a calibration record made with the Veeder-Root counter.

3.4 - The function of the handset switch should be understood. In the "Press-Talk" position, the incoming signal may be heard in the loud speaker or the telephone receiver in the handset, depending on the position of the "Spkr-Handset" switch. If the handset switch is placed in the "Automatic" position, the transmitter will go "on the air" each time speech is impressed on the microphone, and, under these conditions, loud speaker reception cannot be used as feedback will occur from the loud speaker to the microphone and prevent satisfactory operation. When "Automatic" transmission is used, it is important to speak steadily and clearly into the microphone, as, otherwise, "clipping" may occur resulting in the party at the other end of the circuit having difficulty in understanding your conversation. "Automatic" operation is undesirable under conditions of local noise aboard ship, since any sound impressed on the microphone will actuate the transmitter whether or not you are talking.

4 - TRANSMITTER CIRCUITS

4.1 - Refer to drawing T-1210. The crystal controlled oscillator in the transmitter uses a type 809 tube (93). The control grid of this tube is connected to one of the sections of the ganged ten position frequency switch (39) so that the appropriate crystal may be selected. A choke coil (34) is connected in series with the cathode of the 807 oscillator tube to provide a small amount of regeneration or feedback for the crystal oscillator. The output circuit of the crystal oscillator consists of radio frequency transformer (26) which has its primary or plate winding tuned by capacitor (30) and its secondary tuned by capacitor (25). Variable coupling is provided between the primary and secondary of radio frequency transformer (26). The coupling of the radio frequency transformer and the tuning of the primary and secondary windings are adjusted by the factory and locked, so that the crystal oscillator circuit functions automatically throughout the 2000 to 3000 K.C. band of the transmitter. Two resistors (23) connected in parallel are used to load the secondary of the radio frequency transformer. The screen grid of the 807 oscillator tube receives its supply voltage through resistors (29) and is by-passed to ground through capacitor (32). Capacitor (31) by-passes the D.C. end of the primary of the radio frequency transformer. The capacitors (35 and 36) are used as radio frequency voltage dividers for the excitation of the oscillator control grid. The oscillator plate receives its D.C. voltage from the 550 volt output of the motor generator while the screen is supplied from the same cource through resistors (29). Resistor (33) functions as a bleeder for resistors (29).

4.2 - The power amplifier circuit uses four 807 tubes (94 to 97) which are connected in parallel. The control grids of these four tubes receive their radio frequency excitation from the crystal oscillator stage through capacitor (24). The screen grids of the power amplifier tubes are by-passed to ground through capacitor (14), and receive their D.C. supply voltage through two resistors (12) connected in series. The D.C. plate circuit of the power amplifier tubes from the 550 volt generator passes through the secondary winding of modulation transformer (54), through radio frequency choke coil (11), and then to the plates of the tubes. It will be noted that the D.C. screen circuit also must pass through the secondary of transformer (54). This is to enable both plate and screen of the four power amplifier tubes to be modulated as described further in this book. The radio frequency plate circuit of the power amplifier tubes, after passing through plate blocking capacitor (10) connects to the P. A. tank inductors (8) and the P. A. tank capacitor (9). There are two P. A. tank inductors, one of which is tapped for connection to a section of the ten position frequency switch (39).

4.3 - A front panel control, marked "P. A. Tuning" has been provided on TCP-3 transmitters. This control permits the power amplifier tank capacitor (9) to be rotated from the front panel over a range of approximately 20 scale divisions. The "P. A. Tuning" scale is engraved from 10 to 40 divisions, but stops are provided on the capacitor shaft to limit the movement of the pointer over the scale between approximately 15 to 35 divisions. Therefore, each position of the transmitter frequency switch (39) may be "Set Up" and "Calibrated" for any one frequency falling within the bands listed below in paragraph 4.4. The major purpose of the "P. A. Tuning" control on the front panel is to enable the TCP-3 normal frequency "Set Up" for one Naval district to be conveniently changed to a new frequency "Set Up" for another district. A calibration chart frame is mounted on the transmitter panel and three charts are furnished with each equipment so that the necessary record may be made of transmitter switch position, frequency, P. A. tuning and antenna tuning for a maximum of 10 transmitting frequencies.

4.4 - The nominal frequency range that is provided on each of the 10 positions of the frequency switch, in conjunction with the "P. A. Tuning" control, is as follows:

Transmitter Switch Position	Approximate Range (K.C.)
1	2000 - 2250
2	2000 - 2275
3	2000 - 2310
4	2070 - 2385
5	2210 - 2560
6	2350 - 2700
7	2480 - 2870
8	2570 - 2960
9	2625 - 3000
10	2710 - 3000

4.5 - When setting up the transmitter for a group of frequencies for a particular Naval district, careful reference should be made to the ranges listed in paragraph 4.4. For example, with switch position 1 the transmitter crystal must be a frequency between 2000 and 2250 K.C., while for position 2 the crystal must be between 2000 and 2275 K.C. taking care in each case that the crystal frequency for any switch position must fall within the band listed for that position. Always endeavor to select crystals and switch positions so that the crystal frequency is approximately near the center of the specified bands. Since each equipment is normally shipped "Set Up" for a particular Naval district, no changes in the "Set Up" for that district are required.

4.6 - The calibration chart contains the following instructions:

> "Important: - Be sure to adjust P. A. Tuning Control for MINIMUM P. A. Cathode Current with Antenna Tuning adjusted for NO Antenna Current. Then tune Antenna for MAXIMUM Antenna Current. Record settings below."

In other words, for efficient operation it is important to make sure that the "P. A. Tuning" control has been adjusted for minimum P. A. cathode current for each operating frequency at the time the transmitter is installed and for subsequent operation. By recording the settings on the calibration chart, it will then be possible to quickly change from one transmitting frequency to another.

4.7 - Coupling between the power amplifier tank circuit and the antenna circuit is accomplished by means of capacitor (4), two capacitors (5) and four capacitors (6). A seven position antenna coupling switch (7) is used to connect one or more of capacitors (5 and 6) in parallel to capacitor (4). Since P. A. tank current flows through these antenna coupling capacitors and since the "low" end of the antenna inductor (1) is also connected to the antenna coupling capacitors, a suitable voltage is developed to couple out the P. A. tank to the antenna circuit. Access to the antenna coupling switch (7) is obtained through a small hinged door in the upper section of the right hand side panel.

4.8 - The antenna circuit is resonated to the desired frequency by means of a rotating variable inductor (1), controlled from the front panel, thereby enabling one or more turns of this coil to be used in the antenna circuit. Veeder-Root counter is geared to antenna inductor (1). This counter will read 1000 when the coil is rotated to its maximum counterclockwise position for minimum inductance. The counter will read 1445 when the coil is rotated clockwise for maximum inductance. In changing from a lower to a higher frequency, the knob is rotated counterclockwise and the counter will read toward lower numbers. Resistor (3) is used as a static leak for the antenna while the R.F. ammeter (2) is used to measure antenna current.

4.9 - The send-receive relay (40) is equivalent to a double-pole double-throw switch. One pole of this relay transfers the low potential side of the antenna loading inductor either to the transmitter coupling capacitors or to the receiver input circuit. The second pole of this relay, in the transmit position,

connects the cathode circuits of the oscillator and P. A. tubes to ground. In the receive position, this pole connects the receiver audio output circuit to ground and also permits a negative cutoff bias voltage to be applied to the oscillator and P. A. grids, this cutoff voltage being developed around resistor (42). The coil of send-receive relay (49), for "Press-to-Talk" operation, is energized through resistor (51) from the transmitter plate supply voltage divider resistors (63, 64 and 65). In the "Automatic" condition of operation, the coil of the send-receive relay (49) receives its energy from the rectified output of the 6A6 Vodas tube (100). This Vodas tube functions as a full wave rectifier with the grids of the tubes acting as anodes which are connected across the secondary of the driver stage output transformer (55). Therefore, each time speech is impressed on the microphone under "Automatic" conditions, the send-receive relay is automatically energized placing the transmitter "on the air". A variable resistor (52) mounted inside the set and connected in parallel to the output of the Vodas tube permits an adjustment for Vodas sensitivity. In order to prevent overload or damage to the tubes, in the event that operation is attempted on any frequency for which no crystal is installed, the transmitter frequency switch (39) is provided with a ten position interlock section which is wired in series with the coil of send-receive relay (49). The color coded leads to this switch section are, therefore, to be connected to the contacts on the switch only for switch positions which have crystals inserted in the jacks.

4.10 - Telephone modulation is accomplished as follows: The microphone receives its D.C. voltage from the drop across resistor (63). Reactor (58) and capacitor (59) are employed as filters. The microphone is connected to the primary of transformer (57) while the secondary of this transformer is connected to both control grids of the 6A6 microphone audio amplifier (98). The two parallel connected plates of this tube passes through the primary of interstage transformer (56) and through resistor (62) to the 550 volt D.C. supply. Capacitor (67) is an audio by-pass and filter. Grid bias for the 6A6 microphone audio amplifier is obtained by means of cathode resistor (61) which is by-passed by capacitor (66). The secondary winding of interstage transformer (56) feeds the push-pull grids of the 6A6 driver tube (99). The push-pull plates of tube (99) are connected to the primary of driver transformer (55) while the secondary of this transformer is connected to push-pull grids of the 809 modulator tubes (101-102) as well as the two grids of the 6A6 Vodas tube (100). The push-pull plates of the 809 modulator tubes are connected to the primary of modulation transformer (54). The secondary of this transformer is in series with the D.C. plate supply of the power amplifier screen and plate circuits. Accordingly, when speech is impressed upon the microphone, the audio and modulator tubes ultimately develop an audio frequency voltage across the secondary of modulation transformer (54), thereby modulating the carrier wave.

4.11 - The filament circuits of all tubes in the transmitter obtain their supply from filament transformer (53). The primary of this transformer is connected to the collector rings on the transmitter motor generator. The transformer (53) has two secondary windings, one of which feeds the three 6A6 tubes and the two 809 tubes while the other secondary feeds all five 807 tubes.

4.12 - An automatic motor starter (86) assembled inside the transmitter-receiver cabinet is employed to start the transmitter motor generator. The starter coil is energized from the supply line through contacts on the switch hook of the hand telephone assembly, or similar contacts on the switch hook of the remote control unit. With this arrangement, the transmitter motor generator is automatically started each time the handset is removed from its switch hook.

4.13 - Metering of the various circuits is accomplished by means of an 0-50 m.a. D.C. meter (47) in conjunction with meter switch (46). Model TCP-3 equipments which are furnished with a Westinghouse 0-50 m.a. milliammeter, style NY-56418-2, type NX-35, use a one ohm series resistor, Clarostat type L-2822, tolerance plus or minus one percent. This resistor (113) is mounted directly on the back of the meter. Simpson 0-50 m.a. milliammeters, used in other TCP series equipment, do not require the one ohm series resistor. The internal resistance of the Westinghouse meter is half that of the Simpson meter, and, therefore, the use of the one ohm series resistor with the Westinghouse meters permits the same shunts, symbols 41, 43, 44 and 50 to be used with either type of meter.

4.14 - As mentioned in the previous paragraph, the 0-50 m.a. D.C. meter (47) is used in conjunction with meter switch (46). This meter switch has five positions and permits checking of oscillator cathode current, P. A. grid current, P. A. cathode current, modulator cathode current and the current through the send-receive relay coil. Shunts are provided for the various positions of the meter switch. The following currents may be measured with the meter switch:

Position	Circuit	Approx. Scale Reading
1	Oscillator Cathode	20 - 30 **
2	P. A. Grid	6 - 12
*3	P. A. Cathode (loaded out)	22 - 32
*4	Modulator Cathode (Unmodulated)	6 - 8
5	Send-Receive Relay Coil (Push Button Closed)	3

* On positions 3 and 4 of the meter switch, shunts are used internally so that the true current is ten times higher than that indicated on the meter scale. For example, in position "3" 30 m.a. on the meter is equivalent to 300 m.a. P. A. cathode current.

** On position 1 a shunt is used so that true oscillator current is twice as high as that indicated on meter scale. For example, when meter reads 25 m.a., oscillator cathode current is actually 50 m.a.

5 - RECEIVER CIRCUITS

5.1 - Refer to drawing T-1209. The radio receiver unit is a superheterodyne employing eight tubes and using an intermediate frequency of 455 K.C. Provision is made for a maximum of ten pre-tuned frequencies between 2000 and 3000 K.C. In the description which follows, the symbol designations used on the wiring diagrams for the various parts are the numbers in parenthesis used below.

5.2 - The input circuit to the receiver includes radio frequency transformer (3). Its primary winding is connected to the send-receive relay. The secondary winding of transformer (3) connects to the control grid of the 6L7 R. F. amplifier tube (103). The secondary winding is tuned for each of the desired receiving frequencies by means of the variable air trimmer capacitors (10), one of these capacitors being used for each of the frequencies. The control grid and grid #5 of the R. F. amplifier connect to the AVC bias through resistor (5).

5.3 - The second tube in the receiver is the converter 6L7 tube (104) which is coupled to the R. F. amplifier through R. F. transformer (19). The secondary of this transformer is tuned by a second group of trimmer capacitors (11). Grid #5 of the converter tube receives energy from the 6J5 crystal controlled oscillator tube (109) so that an intermediate frequency of 455 K.C. is produced in the plate circuit of the 6L7 converter tube.

5.4 - The 6J5 crystal oscillator tube (109) is crystal controlled, provision being made for ten crystals one of which is used for each receiving frequency.

5.5 - The frequency of the receiver crystals always differs from the frequency of the desired received signal by 455 K.C. In order to keep the crystal frequencies themselves between 2000 and 3000 K.C., the crystals are ground 455 K.C. lower for receiving frequencies above approximately 2500 K.C., and are ground 455 K.C. higher for receiving frequencies below 2500 K.C. A cathode choke (17) in the 6J5 crystal oscillator tube furnishes feedback voltage through capacitor (16) to the control grid of this tube.

5.6 - The first intermediate frequency amplifier 6L7 tube (105) receives its 455 K.C. input through I. F. transformer (28) and delivers amplified output through I. F. transformer (60). The I. F. transformer (60) is coupled to the 6L7 second intermediate frequency amplifier tube (106) and the output of this tube is coupled through I. F. transformer (61) to the diodes of the 6R7 detector-A. F. amplifier tube (107).

5.7 - The audio component of the modulated signal appears across resistor (40) in the 6R7 diode circuit, and is then coupled through capacitor (55) and resistor (42) to the control grid of the triode section of the 6R7 tube. The amplified audio voltage of the plate circuit of the 6R7 tube appears across resistor (44) and is coupled through capacitor (51) to the control grid of the 6V6GT/G output tube (108). The plate circuit of the 6V6GT/G output tube is connected to the primary of output transformer (63). This transformer has two secondary windings, one of which feeds the loud speaker and the other the telephone receiver in the handset. To "Silence" receiver, while transmitting, bias voltage from P. A. grid leak in transmitter

is applied through terminal 14 to the control grid of the 6R7 tube (107).

5.8 - Automatic volume control is applied to the control grid and number 5 grid of the R. F. amplifier, the first I. F. amplifier and the control grid of the mixer. The AVC voltage is developed across resistor (41) which is connected to diode #4 in the 6R7 tube. Resistor (35) and capacitor (59) are used as audio frequency filters on the AVC bus.

5.9 - Volume control is applied to the AVC bus by means of volume control (69) for local control only. The volume switch (71) is used to transfer the volume control circuit to volume control (5) in remote control units, when the latter are used. Volume control may be switched from either transmitter-receiver or remote control unit by throwing volume switch (71) on receiver or (6) on remote control unit "left" or "right" as required.

5.10 - Plate screen and bias voltages for the receiver are obtained from the output of the 5W4 rectifier tube (110). The rectifier transformer (72) comprises a primary winding which is connected to the receiver rotary converter, and has three windings, one winding delivering 6.3 volts for the heaters of the tubes, one winding delivering 5 volts for the filament of the 5W4 rectifier, while the third winding, which is mid-tapped, furnishes 250 volts to the plates of the 5W4 rectifier tube.

5.11 - The receiver is provided with an additional tube socket for a 6J5 tube (111) and a "ringer socket", these parts not being used in normal TCP-3 equipments. The 6J5 ringer amplifier and the ringer socket are normally employed only in commercial installations where the radio receiver is fitted with an automatic bell ringing device. (Radiomarine type ET-8012-D Selective Ringer).

5.12 - The sensitivity of the receiver is such that an R. F. input of 2 to 5 microvolts, modulated 30 percent, at 2500 K.C., will produce an output of 50 milliwatts in the loud speaker. The selectivity provides a total band width of 9 K.C. for a ratio of 2 DB between input voltage off resonance to voltage at resonance. The total band width is approximately 16 K.C. for a 40 DB ratio, and approximately 24 K.C. for a 60 DB ratio. The maximum audio output of the 6V6GT/G output tube (108) is one watt. The radiation from the receiver, when used on any antenna with which the transmitter will operate does not exceed 400 micro-microwatts for compliance with Federal Communications Commission subsection 8.130(b).

5.13 - The ten position three pole frequency switch (13) in the receiver is used to select the R. F. amplifier grid capacitors, the mixer grid capacitors and the appropriate crystal for each of the ten pre-tuned frequencies.

5.14 - The hand telephone assembly CRM-51026 comprises a "Press-to-Talk" handset, a switch hook, and certain resistors, the latter being used to establish an appropriate audio level in the telephone receiver of the handset.

5.15 - The CRM-23230 remote control unit contains a handset and switch hook similar to that of the CRM-51026 hand telephone assembly, and in addition uses a loud speaker, volume control and volume switch. A knockout is provided for a cable (Navy type MHFA-19) to interconnect the remote control unit and the transmitter-receiver cabinet.

6 - INSTALLATION

6.1 - The transmitter-receiver unit should be installed in a location that permits access to both sides of the unit for adjustment and maintenance. Care should be taken not to install the set where it may be subjected to salt spray or excessive moisture conditions. A substantial ground connection should be run between the vessel's metal hull or ground plate to the large stud near the right rear shock mount. The antenna lead-in should be run free from metal bulkheads or other grounded structures and should be connected to the stud or other grounded structures and should be connected to the stud on the insulator at the top of the set. The rear bracket for the transmitter-receiver unit should be installed between the bulkhead and the set so that the unit is properly braced against shipboard vibration.

6.2 - The line filter unit (D.C. power supply only) should be installed on a bulkhead or other convenient point so that it may be connected to the set with the five foot rubber covered cable provided with the transmitter-receiver unit. When connecting the line filter unit to the set, carefully observe the markings in the unit so that the fuse will be dead when the switch is placed in the off position.

6.3 - The incoming power line from the ship's power source connects to the "line" end of the line filter unit. Polarity should be observed to insure that the fuse is in the positive side of the line and that terminal 20 (white lead) on the set is positive. Terminal 19 (black lead) should be negative. Use the following table for wire sizes. Any attempt to employ smaller size of conductor than those listed below will result in excessive voltage drop and unsatisfactory operation of the radiotelephone.

CABLE LENGTH (2 CONDUCTORS) Feet	B & S GAUGE WIRE SIZE	CIRCULAR MILS
	32 VOLT EQUIPMENT	
0 - 35	6	26,250
35 - 60	4	41,740
60 - 100	2	66,370
	115 AND 230 VOLT EQUIPMENTS	
0 - 35	14	4,107
35 - 60	12	6,530
60 - 100	10	10,380

6.4 - When installing a remote control unit, refer to drawing T-1209, remove jumper between 6 and 7 on transmitter-receiver unit and splice and tape the pink lead from the local handset to the lead which runs to terminal "LH" on remote unit.

7 - ANTENNA AND GROUND SYSTEM

7.1 - Careful consideration must be given to constructing an efficient antenna for use with the equipment. In general, the antenna capacitance should not be less than 150 mmfd. nor more than 300 mmfd. The antenna may be of the "T", "L" or vertical rod type. In the case of a "T" or "L" type of antenna using a single wire, the total length, including lead-in should be approximately 25 to 35 feet. If a vertical rod type of antenna is used, a height of not less than 23 feet is necessary. Since antenna characteristics vary greatly between vessels, and depend upon the proximity of rigging, stacks, etc., it is necessary to "cut" the antenna to properly match the equipment. For example, if the transmitter cannot be resonated for frequencies around 2000 K.C., a larger antenna is necessary. Likewise, if resonance is not obtained around 3000 K.C., a smaller antenna is needed. A suitable deck insulator is required to bring the antenna lead through the deck to the antenna post at the top of the transmitter-receiver cabinet. Below the deck, suitable stand-off insulators (approximately 3" long) should be used for the antenna lead.

7.2 - A good low resistance ground system is highly essential. Failure to provide an adequate ground connection will seriously impair transmitter and receiver performance. If the vessel hull is metal, a 1" copper strip or a #4 AWG wire should be run from the ground stud (adjacent to terminal 16 on transmitter-receiver cabinet) to the nearest point which is an integral part of the ship's metal hull. Paint, rust, etc., should be scraped from the hull connection to insure a positive low resistance ground. With wood hull vessels, a ground plate, below the water line, having an area not less than 12 square feet, should be used. This ground plate should then be connected through copper strip, or equivalent, as directly as possible to the ground stud on the transmitter-receiver cabinet. In some cases, the ground connection may be made to the engine bed or propeller shaft, provided the length of the lead to the transmitter-receiver ground stud is not too long. Miscellaneous piping, conduits, etc., on a vessel do not provide satisfactory ground connections.

8 - TRANSMITTER ADJUSTMENTS

8.1 - CAUTION: No adjustments should be made inside the transmitter-receiver unit except by authorized personnel who are familiar with the various circuits and the voltages that are involved. Bear in mind that, whenever the radio receiver is turned on and the handset removed from its switch hook, 550 volts D.C., dangerous to life, exists on filter capacitors, transmitter tube plate leads and other parts of the circuit. Always replace the handset on switch hook and wait until transmitter motor generator has stopped rotating before reaching inside transmitter-receiver unit.

8.2 - Insert all transmitter tubes in their respective sockets, observing the tube types marked on the chassis to insure that the correct tubes are placed in the proper sockets. Receiver tubes are shipped in their sockets. Insert transmitter crystals in the jacks in the upper rear section of the transmitter making certain that the crystals plug into the proper jacks to correspond to the "Trans" switch positions. (See paragraph 4.4 and "Frequency Plates" on front panel).

8.3 - The correct adjustment for the "P. A. Tuning" should then be determined so that a record of this adjustment may be made on the calibration chart, for future use. Place meter switch in position 3 to indicate P. A. cathode current. Temporarily disconnect antenna, or adjust antenna tuning so that no antenna current is obtained. Then turn "Off-On" switch to "On", remove handset, wait 15 seconds for tubes to warm up, and press handset push button. Next adjust "P. A. Tuning" for minimum P. A. cathode current (no antenna current should flow). Repeat this operation for each transmitting frequency which is to be adjusted. Refer to paragraph 4.4 to insure that the frequency for each "Trans" switch position falls within the frequency range shown in paragraph 4.4.

8.4 - Antenna coupling should be adjusted as follows: Connect antenna. Place the "Trans" switch in a position corresponding to the lowest frequency for which the set is to be used. Adjust the seven position antenna coupling capacitor switch to position 6. The first position of this switch is marked (0). Access to this switch is obtained by opening the small door on the upper right side of the equipment. Start the transmitter in the "Press-to-Talk" condition. Close the handset push button and rotate the antenna tuning coil for maximum antenna current. This will correspond to maximum P. A. cathode current as read by position 3 of the meter switch. The ideal power amplifier cathode current, with all circuits properly adjusted, is approximately 300 m.a. (30 on the meter). If the P. A. current is less than this value, the coupling capacitor switch may be adjusted to a lower number. Lower numbers on the coupling capacitor switch increases antenna coupling, while higher numbers decrease the coupling. The highest coupling is obtained when the switch is at the position marked zero (0).

8.5 - Now adjust the transmitter for the highest operating frequency and observe P. A. cathode current. In general, the P. A. cathode current will be lower on the higher frequencies because of increased antenna resistance. The point to observe in adjusting antenna coupling is to obtain the best compromise value for all operating frequencies. It is permissible to use a P. A. cathode current between 225 and 325 m.a., but every effort should be made to adjust for 300 m.a. as nearly as possible. If the set loads out too greatly, even when position 6 is used on the coupling switch, it is recommended that additional coupling capacity be connected in parallel using capacitors from the spare parts that are furnished.. For example, a .0015 type A2-5215 capacitor may be connected in parallel to the .0015 capacitor already in the equipment and the coupling switch then readjusted.

8.6 - Important: After the correct antenna coupling adjustment has been determined, disconnect the antenna temporarily and check the "P. A. Tuning" control setting again for minimum P. A. cathode current. The purpose of this check is to insure that the P. A. tank is kept in resonance when new antenna coupling capacity values have been selected, since variations in antenna coupling capacity will slightly detune the P. A. tank. When final scale readings for "P.A. Tuning" have been determined, for each transmitting frequency, record these settings on the calibration chart.

8.7 - After transmitter circuits have been properly adjusted, "Automatic" operation should be checked. The 50,000 ohm Vodas sensitivity control in the upper left section of the transmitter is set in the factory at maximum sensitivity (full counterclockwise) so that it acts as a high resistance shunt on the send-receive relay (49) coil. If it is found that room noises are sufficient to energize the send-receive relay, then the control should be turned clockwise just enough to keep room noises from energizing the relay. If this control is turned too far clockwise, "Automatic" or "Vodas" operation from the microphone will be unsatisfactory and excessive "clipping" will occur.

8.8 - The installation man should be familiar with the arrangement for the "interlock" connections between the "Trans" switch and the send-receive relay coil. The color coded leads to the switch are to be soldered only to used switch positions, all other leads to be separately taped. Without this protective feature, the power amplifier tubes would draw excessive plate current each time the send-receive relay is closed, if an attempt were made to operate the set on any switch position which is not lined up and provided with a crystal. Refer to the table below for the color code.

1 - Red	6 - Red-Black
2 - Green	7 - Green-Black
3 - Orange	8 - Orange-Black
4 - Blue	9 - Blue-Black
5 - Brown	10 - Brown-Black

8.9 - Modulation should be checked by whistling into the microphone and noting that the antenna current increases during modulation. With the meter switch in position 4 and a whistle into the microphone, the meter reading will increase to approximately 30 to 40 m.a. (See paragraph 4.13).

9 - RECEIVER ADJUSTMENTS

9.1 - All receiver tubes should be in sockets and the appropriate receiver crystals should be in jacks to correspond to the "Recr" switch positions that are to be used. Receiver crystal jacks are located between the group of ten trimmer capacitors toward the front panel and a second group of ten trimmer capacitors toward the rear. Access to the receiver for inserting tubes and crystals, and for alignment purposes, is obtained by loosening the four thumb screws on the receiver front panel, removing the receiver cable clamp from the top end of the fuse panel (in lower compartment), and withdrawing chassis from the cabinet approximately two-thirds out. Take

care not to withdraw chassis completely as this would cause the receiver to fall out of the cabinet and be damaged. Do not run transmitter when adjusting receiver. Keep handset on hook.

9.2 - The intermediate frequency of the receiver is 455 K.C. The I. F. circuits of the receiver have been carefully aligned at the factory and should not be altered unless there is definite evidence that readjustments are required. If the I. F. circuits require realignment, an accurately calibrated 455 K.C. modulated signal generator, or test oscillator, is required. Also required is an audio output voltmeter (0-3 volt rectifier type), which is to be connected across the four ohm voice coil of the loud speaker. One terminal of loud speaker voice coil is "hot" and the other terminal is "ground". The "high side" of the signal generator should be connected through a .01 mfd. blocking capacitor to the control grid cap of the 6L7 converter tube (104), which is the tube adjacent to the 6J5 oscillator tube (109). Do not remove normal connection to the grid cap of 6L7 converter tube (104). Connect ground lead from signal generator to chassis of receiver. With signal generator operating at 455 K.C., modulated, carefully adjust the two screws at the top of each I. F. transformer (28, 60 and 61), until the audio output voltmeter reads maximum. Volume control on receiver should be at maximum during these adjustments and the output from the signal generator should be kept fairly low so as not to overload the receiver circuits. A clearly defined "peak" should be observed when each one of the adjusting screws on the I. F. transformers has been correctly adjusted.

9.3 - The radio frequency adjustments are made by means of capacitors 10 and 11. There are ten separate variable air, 100 mmfd., units for the R. F. amplifier grid circuit and ten similar units for the converter grid circuit. A pair of these units, that is, one in the R. F. amplifier grid and one in the converter grid circuit, must be adjusted for each frequency to be received, with the "Recr" switch in the appropriate position. A modulated signal generator, or test oscillator, 2000-3000 K.C. range should be used and the "high side" of the generator connected to the antenna stud at the top of the cabinet. The low side should connect to receiver chassis (ground). Dependance should not be placed upon the frequency calibration of the signal generator, and instead the test frequency should be varied slightly around its nominal calibration until maximum audio output is obtained. This is permissible because the crystal in the receiver is more accurate than the test oscillator, and, by varying the latter, the required test frequency is automatically obtained. Then, keeping the receiver volume control adjusted to a fairly low value, to avoid overload, adjust trimmer capacitors 10 and 11 for maximum audio output. This same procedure should be followed for each position of the "Recr" switch until all changes are correctly adjusted.

9.4 - If a signal generator, or test oscillator, is not available, trimmer capacitors 10 and 11 may be adjusted by receiving a signal from another vessel, or a shore station, taking care to keep the volume control at a low setting to avoid overload. If such facilities cannot be employed, incoming atmospheric noise may be used to

adjust capacitors 10 and 11, provided special care is taken not to misadjust the capacitors to "image" frequencies. Two "peaks" may sometimes be obtained on capacitors 10 and 11, one of which is the correct"peak" and the other an "image". To avoid this, look at the trimmer capacitors from the underside of receiver chassis and observe that the following adjustment has been made. When the received signal frequency is below approximately 2500 K.C., the correct "peak" setting for capacitors 10 and 11 should be such that more than half of the plates are meshed. For frequencies above 2500 K.C., less than half of the plates should be meshed. On the other hand, if image peaks, using noise, have been accidently obtained, capacitors 10 and 11 would be misadjusted so that the plates are practically all "in" (fully meshed) for frequencies above 2500 K.C., and nearly all "out" (unmeshed) for frequencies below 2500 K.C. For example, suppose 3000 K.C. is the receiving frequency, the "image" 910 K.C. lower than this value would be 2090 K.C. To resonate capacitors 10 and 11 to 2090 K.C. requires nearly all of their capacity which is obviously incorrect since the capacitors would be adjusted to use only a small fraction of their capacity when properly tuned to 3000 K.C.

10 - MAINTENANCE

10.1-The contacts on the send-receive relay should be inspected occasionally to insure that they are clean and properly adjusted. These contacts op rate in a certain sequence and care should be taken when cleaning the relay not to bend any of the springs. The correct contact sequence which should occur when the relay armature closes is:

1 - Back movable contact arm breaks circuit.
2 - Forward movable contact arms breaks circuit.
3 - Forward movable contact arm makes circuit.
4 - Back movable contact arm makes circuit.

Correct contact sequence will insure no sparking at the antenna contact and freedom from clicks in the receiver. No adjustments should be made of relay armature clearance except by competent personnel.

10.2 - If a reduction in receiver sensitivity is observed and a check of the contacts on the send-receive relay indicates good contact, then the receiver tubes should be replaced one at a time with new tubes to determine if any one of the tubes require replacement. The various D.C. voltages from the receiver rectifier output circuit may be checked with a high resistance voltmeter by referring to the values on the circuit diagram.

10.3 - In the event of difficulties with the transmitter, or receiver which are not corrected by tube replacements, conventional measurements, with an ohmmeter and a voltmeter may be made to determine if resistors, capacitors, transformers, etc. are normal.

10.4 - After the equipment has been used for a reasonable period, the commutators and brushes on the machines should be inspected and cleaned, if necessary. New brushes should be installed, if inspection shows that the brushes in the machines have worn appreciably.

10.5 - The side panels for the set should be kept firmly fastened in place, all tubes kept properly seated in their sockets and the entire equipment maintained in an orderly manner for maximum performance and reliability.

10.6 - The taps on the primary of the receiver power transformer and on the primary and secondary of the transmitter filament transformer are adjusted by the manufacturer for the specified line voltage. In special cases, due to low or high ship's line voltage, it may be desirable to change these taps, provided appropriate measurements are made of the filament voltage. In the case of the receiver transformer, that primary tap should be selected which provides as closely as possible a value of 6.3 volts at the tube sockets. In the case of the transmitter filament transformer, a primary tap may be selected which also provides 6.3 volts at the transmitting tube sockets. The secondary taps on the transmitter filament transformer should not be altered.

10.7 - The radio receiver chassis may be withdrawn by removing the four thumb screws on the receiver front panel. The 13 conductor color coded cable permanently wired to the receiver chassis terminates on the other end at the main terminal board. This cable may be disconnected from the terminal board and the cable clamp above the fuses removed temporarily. The receiver should then be pulled straight out from the cabinet, taking care not to damage the parts on the underside of the upper transmitter sub-panel. If access is required to the various parts on the underside of the transmitter upper panel, it is recommended that the receiver chassis be removed as outlined above.

10.8 - Inspection of the antenna tuning rotating inductor should be made occasionally by removing the top panel from the cabinet and observing that the slider is properly engaging the turns. After considerable use, metal filings may accumulate between turns, due to normal wear and tear, and the coil may be cleaned by using a small brush. Do not apply any lubricant to the contact shoe or its supporting rod. The slider engages against a stop at each end of the coil when the latter is rotated to its position of minimum or maximum inductance.

10.9 - No attempt should be made to alter the coupling or tuning adjustments of the crystal oscillator output circuit, as this circuit is carefully aligned at the factory and locked.

10.10 - The modulation capability of the transmitter should be checked at regular intervals by whistling into the microphone and noting that the antenna current increases approximately 15 to 20 percent. Modulation below normal can be due to a weak crystal oscillator tube, or weak 6A6 or 809 tubes. If no modulation at all is obtained and replacement of the tubes in the transmitter with spare tubes does not correct the trouble, this is an indication of an open circuit or shorted capacitor somewhere between the microphone and the 809 modulator circuit. Use of the meter switch for checking the currents in the various circuits will be found helpful in localizing the trouble.

10.11 - If the antenna current is below normal and the antenna insulation is in good condition, replacement of the crystal oscillator tube and one or more of the power amplifier tubes should be made. Normal operation of the power amplifier circuit, with antenna detuned or disconnected, should show a value of approximately 70 m.a. (7 on the meter) of P. A. cathode current, meter switch position 3. If this circuit appears normal and little or no antenna current is obtained when the antenna tuning inductor is adjusted for resonance, then the coupling capacitors 4, 5 and 6 and the antenna coupling switch 7 should be checked. A shorted coupling capacitor will, of course, result in no antenna current.

10.12 - WARNING: Operating personnel should not attempt to measure potentials in excess of 500 volts due to hazards to life. Maintenance personnel should exercise extreme care when using external meters to measure any voltages in excess of 500 volts. Reference should be made to the circuit diagrams enclosed in the book for various voltage measurements throughout the transmitter and receiver circuits. Such voltage measurements will be found useful in locating trouble and in determining whether or not resistors or coils are open circuited or capacitors short circuited. In making voltage measurements, it is essential to use a high resistance voltmeter such as the OE-5 or a similar instrument having a resistance of at least 1000 ohms per volt. This is particularly true in measuring receiver circuit voltages, since the current drawn by the voltmeter will produce additional drop in the various resistors connected in circuit.

10.13 - In the event of complete non-operation of the transmitter or receiver unit, it is apparent that the fuses on the fuse board should be checked and that the line voltage supply also be checked. If transmitter is tested with receiver unit removed from cabinet, be sure to temporarily connect terminal 13 on main terminal board to ground, otherwise P. A. grid leak circuit will be open.

10.14 - The push button in the telephone handset may be removed for inspection or cleaning by using the Hinckley-Myers spline wrench which is supplied with the spare parts.

11 - MACHINE MAINTENANCE

Receiver Rotary Converter — Transmitter Motor Generator

11.1 - The receiver inverter (rotary converter) should be inspected and lubricated once every three months, if the equipment is in more or less continuous service. The transmitter motor generator should be inspected and lubricated once every nine months.

11.2 - For lubrication of ball bearings in the receiver rotary converter and transmitter motor generator, the following lubricants, or their equivalent, are recommended:

Lubrico M-6 or M-21 - Master Lubricant Company, Philadelphia, Pa.
Andoc C - Standard Oil Company of New Jersey
Lubriplate (Ball Bearing Type) - Fiske Brothers Refining Company, Newark, N. J.
A-29 - New York and New Jersey Company

11.3 - Access to the ball bearings of the receiver rotary converter is obtained by unscrewing the plugs at the end of each bearing. The entire rotary converter should be removed from the cabinet when the machine is lubricated and inspected, by unsoldering the two D. C. input leads removing the A. C. output plug and removing the nuts from the four studs which hold the base of the converter to the bottom of the cabinet. Do not remove the round head screws which pass through the rubber shock mounts on the mounting feet of the converter itself.

11.4 - Access to the transmitter motor generator is obtained by removing the lower front panel and the rear shield on the cabinet. Tnen remove the end bands of this machine. Next remove the bearing cover plates, held with two screws at the ends of the bearings.

11.5 - Pack receiver rotary converter and transmitter motor generator ball bearings with clean lubricant so that the bearings are not more than one-third filled. Bearings should not be totally packed as excess grease may cause overheating and dirt may collect on commutators or collector rings. After bearings are greased, replace grease plugs on rotary converter and bearing cover plates, and also end covers on motor generator.

11.6 - At the time bearings are lubricated, the conditions of commutators, collector rings and brushes should be checked. Commutators and rings in good condition should be free from burning and pitting, and should present a smooth light brown appearance. If necessary to sand commutators or rings, use #00 sandpaper or finer. Emery cloth must not be used as metallic particles will introduce shorts between commutator bars. Normally a clean piece of canvas may be used to "buff" commutators and rings. Avoid electric shock when dressing commutators and rings with machines rotating and with power on.

11.7 - When inspecting brushes, take special care to remove one brush at a time, placing a check mark on the top surface of the brush so that, when it is replaced in brush holder, it may be replaced in the same position. (If brush is replaced inverted, it will not bear on commutator in the same manner as originally "worn in".) When brushes have worn to approximately one-half their length when new, they should be replaced with new brushes. New brushes should be "sanded in" by placing a strip of #00 sandpaper around commutator or collector ring, with the rough side toward the brush, and the armature rotated by hand to conform the brush face to the curvature of commutator or collector ring.

12 - WINDING DATA

Radio Transmitter: The numbers in parenthesis correspond to similar numbers on drawing T-1210.

12.1 - Antenna Inductor (1): Coil form Alsimag 21852, 6 inches long by 2 inches O.D., threaded for a nine turn per inch winding and wound with a total of 45 turns of #14 AWG tinned copper wire.

12.2 - Power Amplifier Tank Coils (8): Two used. Black Isolantite type #20849 or Alsimag F-9340. 3-1/2 inches long and 2-1/2 inches O.D. Each coil wound with 22 turns of #16 AWG tinned copper wire. One of the two coils is tapped at every turn.

12.3 - Oscillator Coil Assembly (26): Primary, #26 AWG enamel, close wound with a single layer of 28-1/2 turns on bakelite form 1-1/8 inches long and 1-1/2 inches O.D. Secondary #26 AWG enamel, close wound with a single layer of 31 turns on bakelite form 4 inches long and 1-7/8 inches O.D.

12.4 - Send-Receive Relay Coil (49): Coil wound with 37,000 turns of #39 AWG enamel copper wire, resistance 5,000 ohms D.C.

12.5 - Filament Transformer (53):

For 115 Volt D.C. Supply - Type S-8059

Primary: #21 enamelled, 212 turns, taps at 176 and 194 turns
Secondary: #14 enamelled, 21 turns, taps at 17½ and 19½ turns
Secondary: #12 enamelled, 18 turns, center tapped.

For 32 Volt D.C. Supply - Type S-8074

Primary: #15 enamelled, 57 turns, taps at 46 and 52 turns
Secondary: #14 enamelled, 21 turns, taps at 17½ and 19½ turns
Secondary: #12 enamelled, 18 turns, center tapped.

For 230 Volt D.C. Supply - Type S-11314

Primary: #24 enamelled, 420 turns, tapped at 360 and 387 turns
Secondary: #14 enamelled, 21 turns, taps at 17½ and 19½ turns
Secondary: #12 enamelled, 18 turns, center tapped.

For 115 Volt A.C. Supply - Type S-12591

Primary: #22 enamelled, 540 turns, tapped at 495 and 517 turns
Secondary: #14 enamelled, 36 turns, tapped at 30 and 33 turns
Secondary: #12 enamelled, 30 turns, center tapped
With foil shield between primary and secondary

12.6 - Modulation Transformer (54): - Type T-494-A

Primary: #27 enamelled, 1560 turns, taps at 315, 630 and 1050 turns.
Secondary: #28 enamelled, 840 turns, tapped at 360 turns
Secondary: #28 enamelled, 840 turns, tapped at 480 turns

12.7 - Interstage Transformer (56): - Type T-251

Primary: #36 enamelled, 2300 turns.
Secondary: Two sections - #33 enamelled, 1000 turns each

12.8 - Driver Transformer (55): - Type T-264-A

Primary: #33 enamelled, 700 turns, taps at 400 and 600 turns.
Primary: #33 enamelled, 700 turns, taps at 100 and 300 turns.
Secondary: #33 enamelled, 900 turns, tapped at 400 and 700 turns.
Secondary: #33 enamelled, 900 turns, tapped at 200 and 500 turns.

12.9 - Microphone Transformer (57): - Type T-1

Primary: #35 enamelled, 750 turns
Primary: #35 enamelled, 750 turns
Secondary: #42 enamelled, 9380

12.10 - Microphone Reactor (58): - Type T-152

#30 enamelled, 2900 turns.

Radio Receiver: The numbers in parenthesis correspond to similar numbers on drawing T-1209.

12.11 - R. F. Coil Assembly (3):

Primary Winding #31 AWG enamelled, single silk, universal wound with 33 turns to an inductance of 50 microhenries.
Secondary Winding with 10/41 Litz single layer of 58-1/2 turns to an inductance of 60 microhenries. Spacing between primary and secondary, 1/8". Coil form bakelite 2-1/4" long, 1" O.D.

12.12 - Interstage Coil Assembly (19):

Same as R. F. Coil Assembly (3).

12.13 - I. F. Transformer (28): - Type 9900

Primary 7/41 Litz, Universal wound with 330 turns with tap at 60 turns.
Secondary 7/41 Litz, Universal wound with 330 turns.

12.14 - I. F. Transformer (60): - Type 9900

Same as I. F. Transformer (28)

12.15 - I. F. Transformer (61): - Type 9901

Primary 7/41 Litz, Universal wound for 330 turns with tap at 150 turns.
Secondary 7/41 Litz, Universal wound with 330 turns.

12.16 - Audio Output Transformer (63): - Type T-104

Primary: #36 enamelled, 2822 turns.
Secondary: #32 enamelled, 735 turns, tapped at 315 turns
Secondary: #23 enamelled, 130 turns, tapped at 68 and 97 turns

12.17 - Power Transformer (72): - Type S-7961-B

Primary: #23 enamelled, 420 turns, tapped at 350 and 385 turns.
Secondary: #33 enamelled, 1920 turns, center tapped.
Secondary: #16 enamelled, 19 turns.
Secondary: #18 enamelled, 24 turns.

115 VOLT A. C. EQUIPMENT ONLY

12.18 - Transmitter Rectifier Filament Transformer -

- Type S-12590

Primary: #28 enamelled, 700 turns, tapped at 640 and 670 turns
Secondary: #12 enamelled, 16 turns, center tapped

12.19 - Transmitter Rectifier Plate Transformer -

- Type S-12589

Primary: #15 enamelled, 178 turns, tapped at 163 and 170 turns
Secondary: #23 enamelled, 2200 turns, center tapped

12.20 - Transmitter Rectifier Filter Reactor - Type S-12592

#23 enamelled, 3370 turns.

13 - VACUUM TUBES

13.1 - All tubes supplied with the equipment or as spares on the equipment contract shall be used in the equipment prior to employment of tubes from general stock.

13.2 - List of Tubes Employed:

In The Transmitter

1 - Type 807 tube as Class "C" Oscillator, Crystal Controlled (93)
4 - Type 807 tubes as Class "C" Amplifiers, plate modulated (94-95-96-97)
2 - Type 809 tubes as push pull Class "B" Modulators (101-102)
1 - Type 6A6 tube as push pull Class "B" Audio Driver (99)
1 - Type 6A6 tube as Class "A" Microphone Audio Amplifier (98)
1 - Type 6A6 tube as Vodas Audio Rectifier (100)
2 - Type 866A/866 tubes as Transmitter Plate Supply Rectifiers (115-116)

In The Receiver

1 - Type 6L7 tube as Radio Frequency Amplifier (103)
1 - Type 6L7 tube as Converter (104)
1 - Type 6L7 tube as First I.F. Amplifier (105)
1 - Type 6L7 tube as Second I.F. Amplifier (106)
1 - Type 6J5 tube as Class "C" Oscillator, Crystal Controlled (109)
1 - Type 6R7 tube as Second Detector-First Audio Amplifier (107)
1 - Type 6V6GT/G tube as Class "A" Second Audio Amplifier (108)
1 - Type 5W4 tube as power rectifier (110)

13.3 - The vacuum tubes used in this equipment must be operated at their correct heater or filament potential in order to obtain satisfactory tube life. Excessive line voltage supply will result in over-voltage on the vacuum tubes, while subnormal supply voltage will result in reducing emission from the filaments and in time decrease performance. Reference should be made to the instructions in paragraph 10.6 for cases where the supply voltage is regularly high or low.

13.4 - The following tabulation compares the operation of the tubes, as used in the equipment, with the maximum ratings as specified by the tube manufacturer.

13.5 - Type 807 tube as Class "C" Oscillator, crystal controlled.

	Full Load Operating Data		Maximum Rating	
Plate Voltage		550 Volts		600 Volts
Plate Current		50 m.a.		100 m.a.
Plate Dissipation		18 Watts		25 Watts
Filament Voltage		6.3 Volts		6.3 Volts
Filament Current		.9 Amps		.9 Amps
Control Grid Volts (DC)	Minus	25 Volts	Minus	90 Volts
Control Grid Current (DC)		1 m.a.		3.5 m.a.
Screen Grid Voltage		150 Volts		300 Volts
Screen Grid Watts		1 Watt		2.5 Watts

13.6 - Type 807 tube as Class "C" Amplifier, plate modulated.

Plate Voltage		550 Volts		600 Volts
Plate Current		80 m.a.		100 m.a.
Plate Dissipation		22 Watts		25 Watts
Filament Voltage		6.3 Volts		6.3 Volts
Filament Current		.9 Amps		.9 Amps
Control Grid Volts (DC)	Minus	50 Volts	Minus	90 Volts
Control Grid Current (DC)		3 m.a.		3.5 m.a.
Screen Grid Voltage		200 Volts		300 Volts
Screen Grid Watts		2.5 Watts		2.5 Watts

13.7 - Type 809 tube (2 are used) as push pull, Class "B" Modulators.

Plate Voltage		550 Volts		750 Volts
Plate Current		40 m.a.		100 m.a.
Plate Dissipation		22 Watts		25 Watts
Filament Voltage		6.3 Volts		6.3 Volts
Filament Current		2.5 Amps		2.5 Amps
Control Grid Volts (DC)		0 Volts		0 Volts

13.8 - Type 6A6 Tube as push pull Class "B" Audio Driver.

	Full Load Operating Data	Maximum Rating
Plate Voltage	300 Volts	300 Volts
Plate current	35 m.a.	35 m.a.
Plate Dissipation	10 Watts	10 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.8 Amps	.8 Amps

13.9 - Type 6A6 tube as Class "A" Microphone Audio Amplifier.

Plate Voltage		270 Volts	300 Volts
Plate Current		7 m.a.	7 m.a.
Plate Dissipation		5.4 Watts	10 Watts
Filament Voltage		6.3 Volts	6.3 Volts
Filament Current		.8 Amps	.8 Amps
Control Grid Voltage (DC)	Minus	6 Volts	Minus 6 Volts

13.10 - Type 6A6 Tube as Vodas Audio Rectifier. This tube is used as a simple full wave rectifier with the two grids functioning as anodes and with the two plates connected to the cathode to deliver approximately 3 m.a. at 150 volts D.C. for the send-receive relay coil.

13.11 - Type 6L7 tube as Class "A" Radio Frequency Amplifier.

Plate Voltage	210 Volts	300 Volts
Screen Voltage	90 Volts	100 Volts
Plate Dissipation	1 Watt	1.5 Watt
Screen Dissipation	.5 Watt	1.0 Watt
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.3 Amps	.3 Amps

13.12 - Type 6L7 tube as Converter

Plate Voltage	180 Volts	300 Volts
Screen Voltage	90 Volts	150 Volts
Plate Dissipation	.8 Watts	1.0 Watt
Screen Dissipation	.8 Watts	1.5 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.3 Amps	.3 Amps

13.13 - Type 6L7 tube as Class "A" I. F. Amplifier in First and Second Stages.

Same as Type 6L7 tube in paragraph 13.11

13.14 - Type 6J5 tube as Crystal Controlled R.F. Oscillator.

Plate Voltage	150 Volts	300 Volts
Plate Dissipation	.75 Watts	2.5 Watts
Plate Current	5 m.a.	20 m.a.
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.3 Amps	.3 Amps

13.15 - Type 6R7 tube as Second Detector and First Audio Amplifier.

	Full Load Operating Data	Maximum Rating
Plate Voltage	90 Volts	250 Volts
Plate Dissipation	.18 Watts	2.5 Watts
Plate Current	2 m.a.	9.5 m.a.
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	3 Amps	.3 Amps

13.16 - Type 6V6-GT/G Class "A" Second Audio Amplifier.

Plate Voltage	200 Volts	315 Volts
Screen Voltage	200 Volts	285 Volts
Plate Dissipation	6 Watts	12 Watts
Screen Dissipation	.8 Watts	2 Watts
Plate Current	30 m.a.	34 m.a.
Screen Current	4 m.a.	2.2 m.a.
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.45 Amps	.45 Amps

13.17 - Type 5W4 tube as Full Wave Rectifier.

Peak Inverse Voltage	700 Volts	1400 Volts
Peak Inverse Plate Current (per plate)	200 m.a.	300 m.a.
DC Output Current	80 m.a.	100 m.a.
Filament Voltage	5 Volts	5 Volts
Filament Current	1.5 Amps	1.5 Amps

13.18 - Type 866A/866 tube (2 are used) as Transmitter Plate Supply Rectifiers.

Filament Voltage	2.5 Volts	2.5 Volts
Filament Current	5 Amps	5 Amps
Peak Inverse Voltage	2000 Volts	2000 Volts
Peak Plate Current	1.0 Amp	2.0 Amp
Average Plate Current	500 m.a.	500 m.a.

13.19 - In the above tabulation of transmitter tubes, the type 807 power amplifier tubes are operated as plate modulated power amplifiers between CCS and ICAS ratings. Due to the naturally intermittant nature of the load on these tubes in "send-receive" operation, normal average tube life will be obtained.

14 - COASTAL HARBOR STATIONS AND CRYSTAL LIST

HARBOR STATION	CALL LETTERS	TRANS. CRYS.	RECR. CRYS.	RECR. FREQ.
Boston, Mass.	WOU	2110	2051	2506
San Francisco, Cal.	KLH	2110	2051	2506
Miami, Fla	WDR	2118	2059	2514
Lorain, O.	WMI	2118	2059	2514
Port Washington, Wis.	WAD	2118	2059	2514
Duluth, Minn.	WAS	2118	2059	2514
Lake Bluff, Ill.	WAY	2118	2059	2514
Buffalo, N. Y.	WBL	2118	2059	2514
New York N. Y. (2nd Channel)	WOX	2126	2067	2522
Seattle, Wash.	KOW	2126	2067	2522
San Juan, P.R.	WCT	2134	2075	2530
Galveston, Tex.	KQP	2134	2075	2530
Norfolk, Va.	WGB	2142	2083	2538
Tampa, Fla.	WFA	2158	2095	2550
Lorain, O.	WMI	2158	2095	2550
Port Washington, Wis.	WAD	2158	2095	2550
Duluth, Minn.	WAS	2158	2095	2550
Lake Bluff, Ill.	WAY	2158	2095	2550
Buffalo	WBL	2158	2095	2550
Wilmington, Del. (Delaware City)	WEH	2166	2103	2558
Ocean Gate, N. J.	WAQ	2166	2103	2558
Charleston, N. C.	WER	2174	2111	2566
Los Angeles, Cal. (San Pedro)	KOU	2174	2111	2566
All Great Lakes Stations	(Calling)	2182	2637	2182
New York, N.Y. (1st Channel)	WOX	2198	2135	2590
New Orleans, La.	WAK	2206	2143	2598
Astoria, Ore.	KFX	2206	2143	2598
Portland, Ore.	KQX	2206	2143	2598
U. S. Coast Guard Stations		2670	2215	2670
Intership		2738	2283	2738
C & D & Cape Cod Canals		2350	2805	2350
Second Intership Channel		2638	2183	2638
St. Louis, Mo.	WGK	2782	2327	2782
Memphis, Tenn	WJG	2782	2327	2782
Lake Bluff, Ill.	WAY	2782	2327	2782
Louisville, Ky.	WFN	2782	2327	2782

MODEL TCP-3

INSTRUCTIONS FOR POWER CONVERSION KIT

The following instructions apply with respect to 32 volt power conversion kit, when the latter is furnished, so that TCP-3 equipment, normally built for 115 volts or 230 volts D.C. supply, may be changed over for operation on 32 volts D.C.

The following units comprise a 32 volt kit. The symbol designations referred to are the same as those shown in the tables, circuit diagrams and photographs in the instruction book.

Quantity	Symbol Designation	Part
1	-	Nameplate, MODEL TCP-3, 32 V. DC (with blank serial number pad)
1	-	Nameplate, TYPE CRM-43009-A, 32 V DC (with blank serial number pad)
1	-	Line Filter Unit, type CRM-53085, 32 V. DC.
1	53	Transformer, transmitter filament, Kenyon Type S-8074.
1	72	Fuse, cartridge, 2", renewable, 250 V, 15 amp.
1	73	Fuse, glass, Littelfuse Type 3-AG, 250 V, 10 amp.
1	76	R.F. Choke, transmitter motor generator input, Ohmite Type 3230
1	85	Motor Generator, transmitter, Type ET-8012-B, Pioneer #SS-2049, 31 V. DC input.
1	86	Motor Generator Starter, GE CR-4052-Y1, Cat. #6932935-G-15, 32 V. DC., with overload heater
1	86b	Resistor, starter coil shunt, IRC type BT-2, 2 W, 2000 ohms. (Mounted in Starter)
1	87	Rotary Converter, receiver, type AK-150, Pioneer #SS-3021, 32 V. DC input.

SPARE PARTS
32 VOLT POWER CONVERSION KIT

12	6 (sec. 5)	Fuse Link, 3", 250 V, 60 Amp.
12	72	Fuse Link, 2", 250 V, 15 Amp.
12	73	Fuse, glass, Littelfuse Type 3-AG, 250 V, 10 amp
1	86b	Resistor, starter coil shunt, IRC Type BT-2, 2 watt, 2000 Ohms.
2 sets	-	Brushes, for motor generator type ET-8012-B, #SS-2049.
2 sets	-	Brushes, for rotary converter type AK-150, #SS-3021
1	-	Filter Assembly, for rotary converter as above
1	-	Starter Coil, #22D104 G3

To replace the existing 115 or 230 volt D.C. units with the equivalent 32 volt units, certain precautions should be observed as outlined below:

Line Filter Unit: Remove CRM-53086 (115 volt) or CRM-53192 (230 volt) Line Filter Unit and replace with CRM-53085 Line Filter Unit (32 volt).

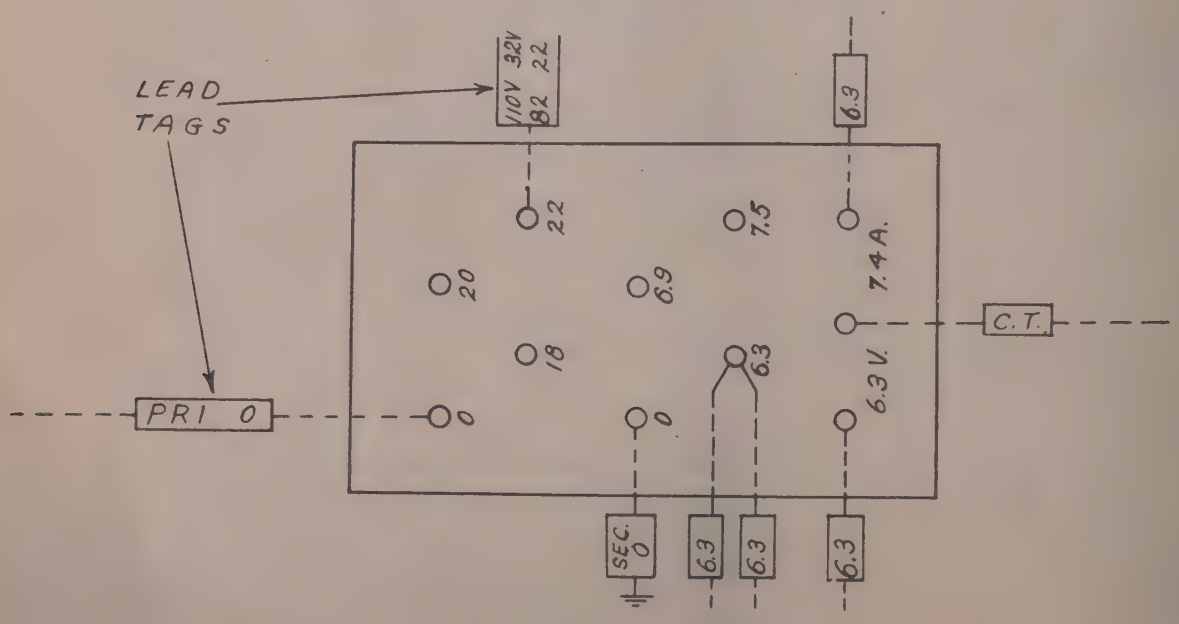
Transmitter Motor Generator: Remove motor generator and replace with motor generator SS-2049 (32 volt D.C.). In performing this operation, care should be taken to retain the leads to the terminal board in their same relative position so that transposition of wiring will not occur when the 32 volt machine is connected.

Receiver Rotary Converter: Remove rotary converter and replace with rotary converter Type AK-150, SS-3021 (32 volt D.C.).

Transmitter Motor Generator R. F. Choke: Remove present type Z-22 choke and replace with type 3230. This choke is mounted underneath the rear end of the transmitter motor generator.

Fuses: Remove 250 volt, 10 amp or 6 amp, cartridge fuse and replace with 250 volt, 15 amp, cartridge fuse. Remove 250 volt, 3 amp or 2 amp, glass fuse and replace 250 volt, 10 amp, glass fuse (type 3-AG).

Filament Transformers: Remove radio receiver and turn set upside down to provide access to the soldered terminals at the base of the filament transformer. This is transformer symbol 53. Carefully unsolder leads, keeping them in their same relative position and then remove transformer S-8059 or S-11314. Replace with transformer S-8074. Refer to sketch below to identify the various leads as they are to be connected to transformer S-8074



Nameplates: Install the Model and Type nameplates which are furnished.

Motor Starter: Remove present 115 volt or 230 volt DC motor starter and replace with catalog 6932935-G-15 starter for 32 volts DC When this is done, observe carefully the connections to the starter so that they are not transposed when the 32 volt unit is connected. The starter lead marked "Htr" is a lead which connects to the terminal marked "L2", drawing T-1210. Terminal "L2" is actually the connection for the heater type overload relay on the motor starter. Other starter leads are marked "A2", "A1-LI", and "2". The 2000 ohm, 2 watt, starter coil shunt resistor, symbol 86b, will be found already connected and mounted on the 32 volt starter. The overload heater furnished with the 32 volt starter is #81D266.

TABLE NO. 1

LIST OF MAJOR UNITS

MODEL TCP-3 - RADIOTELEPHONE EQUIPMENT

CONTRACT NXsr-55686 Dated April 19, 1944

Navy Type Designation.	Name	Assembly Drawing
CRM-43010-A	Transmitter-Receiver (115 Volts D.C.)	KS-12
CRM-43061	Transmitter-Receiver (230 Volts D.C.)	KS-12
CRM-43062	Transmitter-Receiver (115 Volts A.C.)	KS-12
CRM-53086	Line Filter Unit (115 Volts D.C.)	KS-15
CRM-53192	Line Filter Unit (230 Volts D.C.)	KS-15
CRM-51026	Hand Telephone Assembly	KS-14
CRM-23230	Remote Control Unit	KS-13
	1 Set of Vacuum Tubes	
	1 Metal Spare Parts Box, 18" X 21" X 12" (For Spare Rotating Equipment)	
	1 Metal Spare Parts Box, 24" X 15" X 15" (For General Spares)	
	1 Set of Spare Parts (Including 200 percent Spare Tubes)	
	2 Instruction Books	

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210 AND T-1286

MODEL TCP-3

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						CAPACITORS - CLASS 4B						
X	X	X	X	* 4	Ant. Coupling Capacitor	Mica, .0015 mfd., plus or minus 10%, 2500 V D.C. Working			I	A2-5215		
X	X	X	X	* 5	Ant. Coup. Capacitor (2 Used)	Mica, .0002 mfd., plus or minus 10%			I	Type C	3000 V D.C.Test	CA-108
X	X	X	X	* 6	Ant. Coup. Capacitor (4 Used)	Mica, .0001 mfd., plus or minus 10%			I	Type C	3000 V D.C.Test	CA-98
X	X	X	X	9	P.A. Tank Capacitor	Air, .0001 mfd., plus or minus 10% 1000 V D.C. 42 Plates			AN	MT-100-GD		CA-33
X	X	X	X	* 10	P.A. Blocking Capacitor	Mica, .002 mfd., plus or minus 10% 5000 V D.C. Test			B	Model NF		CA-146
X	X	X	X	* 14	P.A. Screen Capacitor	SAME AS 10			-	----		---
X	X	X	X	* 15	P.A. Filament Capacitor	Mica, .01 mfd., plus or minus 10% 2500 V D.C. Test			B	Model NF		CA-181
X	X	X	X	* 19	P.A. Cathode Capacitor	Mica, .02 mfd., plus or minus 10% 1000 V D.C. Test			B	Model NF		CA-197
X	X	X	X	* 24	Osc. Coup. Capacitor	Mica, .00005 mfd., plus or minus 10% 5000 V, D.C. Test			B	Model NF		CA-93
X	X	X	X	25	P.A. Grid Capacitor	Air, .0001 mfd., plus or minus 5% 500 V D.C. Working - 19 Plates			AN	Type S-6941		CA-58
X	X	X	X	30	Osc. Plate Capacitor	Air, .00014 mfd., plus or minus 5% 500 V D.C. Working - 27 Plates			AN	Type S-7041		CA-19
X	X	X	X	* 31	Osc. Plate By-Pass Capacitor	SAME AS 15			--	----		---
X	X	X	X	* 32	Osc. Screen By-Pass Capacitor	SAME AS 15			--	----		---
X	X	X	X	* 35	Osc. Grid Capacitor	Mica, 24 mmfd., plus or minus 10% 500 V D.C. Working			I	K-1424		
X	X	X	X	* 36	Osc. Cathode Capacitor	Mica, .00025 mfd., plus or minus 10% 5000 V D.C. Test			B	Model NF		CA-115
X	X	X	X	* 45	Meter Capacitor	Mica, .01 mfd., plus or minus 10% 1000 V D.C. Test			I	Type B-1110		CA-175
X	X	X	X	* 59	Microphone Capacitor	Paper, 4 mfd., plus 10% minus 2½% 600 V D.C. Working			J	9CE5A24		CA-236
X	X	X	X	* 66	Audio Cathode Capacitor	SAME AS 59			-	----		---
X	X	X	X	* 67	Audio Plate Capacitor	SAME AS 59			-	----		---
X	X	X	X	* 68	Driver Plate Capacitor	Paper, 10 mfd., plus 10% minus 2½% 600 V D.C. Working			J	9CE5A28		CA-246
X	X	X	X	* 69	Main Filter Capacitor	SAME AS 59			-	----		---
	X	X	X	* 79	Filter Capacitor (2 Used)	Paper, .1 mfd., plus 10% minus 2½% 1000 V D.C. Working			J	9CE6A14		CA-202
	X	X	X	* 80	Filter Capacitor (2 Used)	SAME AS 79			-	----		---
	X	X	X	* 81	Filter Capacitor (2 Used)	SAME AS 79			-	----		---
X	X	X	X	* 88	Keying Capacitor	SAME AS 79			-	----		---
X				*114	Filter Capacitor (4 Used)	Paper, 4 mfd., plus 10% minus 2½% 1000 V D.C. Working			J	9CE5A33		

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210 AND T-1286.

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						MOTOR-GENERATOR AND ROTARY CONVERTER - CLASS 21 Including Bearings, Brushes, Capacitors, etc.						
		X		* 85	Transmitter Motor Generator	See Page 6 Inst. Book for complete rating	BO	SS-2049				MG-2
			X	* 85	Transmitter Motor Generator	See Page 6 Inst. Book for complete rating	S	ET-8012-D-115				MG-4
X				* 85	Transmitter Motor Generator	See Page 6 Inst. Book for Complete rating	S	ET-8012-D-230				MG-24
X		X	X	*	Trans. M. G. Bearings	For SS-2049, ET-8012-D-115 or ET-8012-D-230	DL	8502 or WC-8502				
X			X	*	Motor Brushes for M.G.	2 Brushes with springs and caps, 1/2 X 3/8 X 7/8 Long - Grade HM-6782	S	See Descrip.				
		X		*	Motor Brushes for M.G.	2 Brushes with springs and caps, 1/2 X 3/8 X 7/8 Long - Grade CM-9	BO	See Descrip.				
X		X	X	*	H.V.Gen. Brushes for M.G.	2 Brushes with springs and caps, 3/8 X 1/8 X 5/8 Long - Grade HM-6165	BO & S	See Descrip.				
X		X	X	*	Coll.Ring Brushes for M.G.	2 Brushes with springs and caps 1/2 X 1/4 X 7/8 Long - Grade AY	BO & S	See Descrip.				
X		X	X	*	85a Motor Capacitor (2 Used)	Mica, .01 mfd., plus or minus 10%, 1000 V D.C. Test	I	B-1110				CA-175
X		X	X	*	85b Slip Ring Capacitor (2 Used)	Mica, .01 mfd., plus or minus 10% 1000 V D.C. Test	I	B-1110				CA-175
X		X	X	*	85c Generator Capacitor (2 Used)	Mica, .01 mfd., plus or minus 10% 2500 V D.C. Test	I	H-2110				
X		X	X	*	Shock Mounts for M. G.(4 Used)	Lord Type 200-PH-25	EN	200-PH-25				
		X		*	87 Receiver Rotary Converter	See Page 5 Inst. Book for complete rating	BO	SS-3021				CVR-14
			X	*	87 Receiver Rotary Converter	See Page 5 Inst. Book for complete rating	BO	SS-3020				CVR-16
X				*	87 Receiver Rotary Converter	See Page 5 Inst. Book for complete rating	BO	SS-3073				CVR-18
X		X	X	*	Rec. Rot. Conv. Bearings	For SS-3021, SS-3020 or SS-3073	DL	8502 or WC-8502				
X		X	X	*	Motor Brushes forRot. Conv.	2 Brushes with springs and caps, 3/8 X 1/2 X 7/8 Long - Grade HM-6782	BO	See Descrip.				
X		X	X	*	Motor Brushes for Rot. Conv.	2 Brushes with springs and caps, 3/8 X 1/2 X 7/8 Long - Grade XMM	BO	See Descrip.				
X		X	X	*	Gen. Brushes for Rot. Conv.	2 Brushes with springs and caps, 1/2 X 1/4 X 7/8 Long - Grade HM-6782	BO	See Descrip.				
X		X	X	*	87b Filter Assembly for Rec. Conv.	Complete Filter Unit for SS-3021, SS-3020 or SS-3073	BO	See Descrip.				
	X	X	X	*	87a Rot. Conv. Capacitor(2Used)	Mica, .01 mfd., plus or minus 10%, 1000 V D.C. Test	I	B-1110				CA-175
						MOTOR GENERATOR STARTER - CLASS 21 Including Contacts & Springs, Coils and Resistors, etc.						
		X			86 Motor Generator Starter	3 Step Constant Accellerator Type (CR-4052-Y1)	J	6932935-G-15				STR-2
			X		86 Motor Generator Starter	3 Step Constant Accellerator Type (CR-4052-Y1)	J	6932935-G-16				STR-3
X					86 Motor Generator Starter	3 Step Constant Accellerator Type (CR-4052-Y1)	J	6932826-G-7				
		X		*	86b Starter Coil Shunt Resistor	2000 Ohms, 2 W, plus or minus 10%, Metallized	G	Type BT-2				RE-148
			X	*	86b Starter Coil Shunt Resistor	10,000 Ohms, 2 W, plus or minus 10%, Metallized	G	Type BT-2				RE-194
X				*	86b Starter Coil Shunt Resistor	20,000 Ohms, 5 W, plus or minus 10%, Carbon	H	D5ST2				

* SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210 AND T-1286.

MODEL TCP-3

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC		SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						MOTOR GENERATOR STARTER - CLASS 21 (Cont'd) Including Contacts & Springs, Coils and Resistors, etc.							
		X		*		Motor Starter Coil	Starter Coil for Cat. 6932935-G-I5			J	22D104-G3		
			X	*		Motor Starter Coil	Starter Coil for Cat. 6932935-G-16			J	22D104-G1		
	X			*		Motor Starter Coil	Starter Coil for Cat. 6934846-G-7			J	22D104-G2		
		X		*	86a	Starter Resistors	Set of 2 - 1.6 Ohms and .7 Ohms			J	2229471-G6-G7		
			X	*	86a	Starter Resistors	Set of 2 - 3 Ohms and 2.25 Ohms			J	2229471-G15-G1		
	X			*	86a	Starter Resistors	Set of 2 - 12.5 Ohms and 10 Ohms			J	2229471-G12-G8		
		X		*		Overload Heater Element	Metallic Strip "T" shaped 38.8-43.5 Amp.			J	81D266		
			X	*		Overload Heater Element	Metallic Strip "T" shaped 11.1-11.8 Amp.			J	81D254		
	X			*		Overload Heater Element	Metallic Strip "T" shaped 6.2-6.8 Amp			J	81D264		
	X	X	X	*		Compression Spring for Cutout Switch Operating Lever	Metallic Spring 7/8 L X 7/16 Diam.			J	2411353		
	X	X	X	*		Movable Contact Tip (Line or Accelerating)	Metallic Strip 1-3/4 X 1/2 X 3/16			J	6978682-G1		
	X	X	X	*		Stationary Accelerating Contact	Metallic Strip "U" shaped with 3 holes			J	6978682-G3		
	X	X	X	*		Stationary Line Contact	Metallic Bar with 2 holes at ends			J	5346447-G4		
	X	X	X	*		Movable Contact for Cutout Switch	Flat Metallic Strip with contacts at ends (side)			J	5344049-G1		
	X	X	X	*		Stationary Cutout Switch Contact				J	2810484-G1		
	X	X	X	*		Stationary Holding Cutout Switch Contact	1/2" Metallic Strip bent in the form of a "V" with contact at one end. Mounting Hole at other end.			J	5344052-G1		
	X	X	X	*		Operating Lever for Cutout Switch	Operating Lever with holding movable contact			J	5344053-G1		
	X	X	X	*		Compression Spring	Compression Spring for Line or Accelerating Contacts			J	246116		
	X	X	X	*		Torsion Spring for Clutch	Torsion Spring 15/16 L X 11/16 Diam.			J	2415678		
	X	X	X	*		Set of Flexible Leads (Shunt)	Bare Stranded wires 6-1/2" long with 5 screw type lugs			J	5344070-G1		
						FUSES - CLASS 28							
		X		*	72	Converter Motor Fuse	250 V, 15 Amp, 2" Renewable Cartridge			C	Standard		FS-19
			X	*	72	Converter Motor Fuse	250 V, 10 Amp, 2" Renewable Cartridge			C	Standard		FS-17
	X			*	72	Converter Motor Fuse	250 V, 6 Amp, 2" Renewable Cartridge			C	Standard		
		X		*	72a	Converter Motor Fuse Links	250 V, 15 Amp			C	Standard		
			X	*	72a	Converter Motor Fuse Links	250 V, 10 Amp			C	Standard		
	X			*	72a	Converter Motor Fuse Links	250 V, 6 Amp			C	Standard		
		X		*	73	Filament Primary Fuse	25 V, 10 Amp, Glass, 1-1/4" Long			D	3-AG #1081		FS-16
X			X	*	73	Filament Primary Fuse	250 V, 3 Amp, Glass, 1-1/4" Long			D	3-AG #1043		FS-10
	X			*	73	Filament Primary Fuse	250 V, 2 Amp, Glass, 1-1/4" Long			D	3-AG #1042		
X	X	X	X	*	74	High Voltage Fuse	3000 V, .75 Amp, 5-7/16" Long			D	#2113		FS-6
	X	X	X	*	75	Converter Output Fuse	250 V, I Amp, Glass, 1-1/4" Long			D	3-AG #1040		FS-7
X				*	104	Receiver Line Fuse	SAME AS 75			-	----		---
X				*	105	Ship's Line Fuse	SAME AS 72 (10 Amp)			-	----		---
X				*	105a	Ship's Line Fuse Link	SAME AS 72a (10 Amp)			-	----		---

*SPARE PARTS REQUIRED: For actual quantity of Spare Parts, refer to table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210 AND T-1286

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC		SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
							INDICATING LAMPS						
X	X	X	X	*	18	Pilot Light	Mazda 40, 6.3 V, 0.15 Amps Miniature Screw Base, Brown Bead			J	Type T-40		LA-5
							JACKS AND RECEPTACLES - CLASS 49						
X	X	X	X	*	40	Crystal Jack Assembly	Bakelite, for 10 Crystals			AH	KS-73		Dwg KS-73
							RELAYS - CLASS 29						
X	X	X	X	*	49	Send-Receive Relay	Double Pole Double Throw, 5000 Ohm Coil			BZ	Type A-1662		RL-33
X				*	106	Power Relay	DPST, 115 V A.C., 110 Ohm Coil			CJ	#6104		
X				*	107	Control Relay	SPDT, 5 m.a. D.C., 3200 Ohm Coil			E	CXB-2126		
							R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47						
X	X	X	X		1	Ant. Loading Inductor	34 Microhenries Total, 45 Turns			A	Type 8020-A		CL-11
X	X	X	X		8	P.A. Tank Inductor (2 Used)	Each Inductor 22 Turns #16 AWG, 16 microhenries Each Coil tapped every turn			A	Special		CL-8
X	X	X	X		11	P.A. Plate Choke	1 Millihenry, 6 Ohms, 600 m.a.			R	Type R-154		CH-8
X	X	X	X		13	P.A. Screen Choke (4 Used)	50 Ohms with 10 turns #14 Bare Wire in Parallel			G	Type BW-1		CH-21
X	X	X	X		20	P.A. Grid Choke	SAME AS 11			-	----		
X	X	X	X		26	Osc. Coil Assembly	Prim. 28½ Turns #26 AWG, Sec. 31 Turns #26 AWG			A	Special		TR-47
X	X	X	X		34	Osc. Cathode Choke	SAME AS 11			-	----		
		X			76	Motor Choke	2 Sections, each sec. 20 turns #10 AWG			L	Type 3230		CH-1
	X		X		76	Motor Choke	2 Sections, each sec. 30 turns #12 AWG			L	Type Z-22		CH-4
	X	X	X		77	A. C. Choke	2 Sections, each sec. 35 turns #22 AWG			L	Type Z-20		CH-2
	X	X	X		78	High Voltage Choke	SAME AS 77			-	----		---
X					103	Power Supply Choke (2Used)	SAME AS 11			-	----		---
							TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30						
		X		*	53	Filament Transformer	Prim. 18, 20 & 22 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps) 2500 V A.C. Test Sec. 2 - 6.3 Volts, 7.4 Amps, C.T.)			N	Type S-8074		TP-3
			X	*	53	Filament Transformer	Prim. 68, 75, 82 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps) 2500 V A.C. Test Sec. 2 - 6.3 Volts, 7.4 Amps - C.T.)			N	Type S-8059		TP-4
	X			*	53	Filament Transformer	Prim. 136, 150, 164 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps) 2500 V A.C. Test Sec. 2 - 6.3 Volts, 7.4 Amps - C.T.)			N	Type S-11314		
X				*	53	Filament Transformer	Prim. 110, 115, 120 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps Sec. 2 - 6.3 Volts, 7.4 Amps, C.T.			N	Type S-12591		
X	X	X	X	*	54	Modulation Transformer	Prim. to match plate to plate load of two 809 tubes - Case 5A Sec. to modulate class "C" load of 550 V, 300 m.a. D.C.			N	Type T-494-A		TA-7
X	X	X	X	*	55	Driver Transformer	Prim. to match plate to plate load of 6A6 Tube - Case 3A Sec. to match grids of two 809 tubes			N	Type T-264-A		TA-12
X	X	X	X	*	56	Interstage Transformer	Prim. to match parallel plates of 6A6 Tube - Case 2A Sec. to match grids of 6A6 tubes			N	Type T-251		TA-9
X	X	X	X	*	58	Microphone Reactor	D.C. Resistance 10 Henries, 200 m.a. D.C. max., 200 Ohms D.C. 1000 V A.C. Test - Case 3A			N	Type T-152		XL-13

*SPARE PARTS FURNISHED: See Table IV for Quantity.

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210 AND T-1286

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

Model TCP-3

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30 (Cont'd)						
X	X	X	X	* 57	Microphone Transformer	Prim. to match carbon microphone-Sec. to match par. grids of 6A6 Tube--			N	Type T-1		TA-2
X				*108	Rectifier Filament Transformer	Prim. 110, 115 & 120 Volts. - 60 Cycles - Case 3A / -Case 1A						
						Sec. 2.5 Volts, 10 Amps, C.T.			N	S-12590		
X				*109	Plate Transformer	Prim. 110, 115 & 120 Volts. - 60 Cycles - Case 8A						
						Sec. 720-0-720 Volts, 500 m.a. D.C.			N	S-12589		
X				*110	Power Supply Filter Reactor (2 Used)	.7 Henries, 70 Ohms, 700 m.a. D.C. - Case 7A			N	S-12592		
						METERS - CLASS 22						
X	X	X	X	2	Antenna Current Ammeter	Ammeter, 0-5 Amps, R.F., Internal Thermocouple				NT-35		
						3½" flush, phenolic case			BQ	Style NY 56418-1		
X	X	X	X	47	Osc., P.A., Mod., Cathode - P.A. grid, Relay Coil Ammeter	Milliammeter D.C., 0-50 m.a.,				NX-35		
						3½" flush, phenolic case			BQ	Style NY 56418-2		
						RESISTORS - CLASS 63						
X	X	X	X	* 3	Antenna Drain Resistor	2 Megohms, 1 W, plus or minus 10%, Carbon			H	C-1		RE-257
X	X	X	X	* 12	P.A.Screen Resistors (2 Used)	5000 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-183
X	X	X	X	* 16	P.A.Plate Resistors (4 Used)	15 Ohms, 5W, plus or minus 10%, Wire Wound			G	Type AA-3-B(PW-2003)		RE-29
X	X	X	X	* 17	P.A.Grid Resistors (4 Used)	SAME AS 16			-	----		---
X	X	X	X	* 21	P.A.Grid Resistors	SAME AS 12			-	----		---
X	X	X	X	* 22	Meter Shunt Resistor	25 Ohms, 5 W, plus or minus 5%, Wire Wound			G	Type AA-3-B		RE-45
X	X	X	X	* 23	Osc. Load Resistors (2 Used)	10,000 Ohms, 2 W, plus or minus 10%, Metallized			G	Type BT-2		RE-194
X	X	X	X	* 27	Osc. Grid Resistor	SAME AS 16			-	----		---
X	X	X	X	* 28	Osc. Plate Resistor	SAME AS 16			-	----		---
X	X	X	X	* 29	Osc. Screen Resistors (2 Used)	100,000 Ohms, 2 W, plus 0, minus 20%, Metallized			G	Type BT-2		RE-235
X	X	X	X	* 33	Osc. Screen Resistor	20,000 Ohms, 2 W, minus 0, plus 20%, Carbon			H	C-2		RE-208
X	X	X	X	* 37	Osc. Grid Resistor	25,000 Ohms, 1 W, plus or minus 10%, Carbon			H	C-1		RE-214
X	X	X	X	* 38	Osc. Crystal Resistor	100 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-64
X	X	X	X	* 41	Meter Shunt Resistor	2 Ohms, 5 W, plus or minus 5%, Wire Wound			G	Type AA-3-B		RE-10
X	X	X	X	* 42	Keying Resistor	50,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		RE-230
X	X	X	X	* 43	Meter Shunt Resistor	0.22 Ohms, plus or minus 5%, Wire Wound			AT	Type 1-FX		RE-1
X	X	X	X	* 44	Meter Shunt Resistor	SAME AS 43			-	----		---
X	X	X	X	* 50	Meter Shunt Resistor	SAME AS 22			-	----		---
X	X	X	X	* 51	Relay Coil Resistor	25,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		RE-215
X	X	X	X	* 52	Vodas Sensitivity Control Resistor	50,000 Ohms, plus or minus 10%, Variable Type CS, Taper "E"			G	(50,000 E (VC 9058-4062		
X	X	X	X	* 60	Audio Grid Resistor	50,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-227
X	X	X	X	* 61	Audio Cathode Resistor	750 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-126
X	X	X	X	* 62	Audio Plate Resistor	40,000 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-225
X	X	X	X	* 63	Voltage Divider Resistor	200 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-80
X	X	X	X	* 64	Voltage Divider Resistor(4 Used)	SAME AS 12			-	----		---
X	X	X	X	* 65	Voltage Divider Resistor(4 Used)	10,000 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-196
X	X	X	X	* 70	Vodas Resistor (2 Used)	1000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-133
X	X	X	X	* 89	Keying Filter Resistor	500 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-108
X	X	X	X	* 90	Osc. Keying Resistor	SAME AS 42			-	----		---
X	X	X	X	* 91	Coup. Capacitor Resistor	SAME AS 23			-	----		---
X				*111	Cont.Relay Ser. Resist.(2 Used)	SAME AS 51			-	----		---
X				*112	Bleeder Resistor (2 Used)	500,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		
X	X	X	X	*113	Meter Series Resistor (Westinghouse Meters Only)	1 Ohm, .75 watt, plus or minus 1%, wire wound			AT	L-2822		

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

Model TCP-3

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210 AND T-1286

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						SWITCHES - CLASS 24						
X	X	X	X	* 7	Ant. Coup. Switch	S P, 7 position, shorting type			CG	H-22291-HIC		SW-27
X	X	X	X	* 39	Trans. Frequency Switch	2 Pole, 10 position, 2 Sections						
						1 Two Gang			AR	Type 8012-B)		
						1 One Gang			AR	Type 8012-SB)		SW-67
X	X	X	X	* 46	Meter Switch	2 Pole, 5 Position			CG	23263-HIC		SW-57
X	X	X	X	* 48	Handset Switch	4 Pole, double throw			CG	23262-HIC		SW-70
X	X	X	X	* 71	On-Off Switch	Double Pole, single throw			CD	Type 80600		SW-38
X	X	X	X	* 92	Handset Speaker Switch	Single Pole, double throw			CD	Type 21350		SW-11
						VACUUM TUBES - CLASS 38						
X	X	X	X	* 93	Crystal Osc. Tube	Transmitting Beam Power Tube			B	Type 807		
X	X	X	X	* 94	Power Amplifier Tube	SAME AS 93			"	----		
X	X	X	X	* 95	Power Amplifier Tube	SAME AS 93			"	----		
X	X	X	X	* 96	Power Amplifier Tube	SAME AS 93			"	----		
X	X	X	X	* 97	Power Amplifier Tube	SAME AS 93			"	----		
X	X	X	X	* 98	Microphone Amplifier Tube	Twin Triode Amplifier			B	Type 6A6		
X	X	X	X	* 99	Audio Driver Tube	SAME AS 98			"	----		
X	X	X	X	* 100	Vodas Audio Rect. Tube	SAME AS 98			"	----		
X	X	X	X	* 101	Modulator Tube	Class "B" Triode			B	Type 809		
X	X	X	X	* 102	Modulator Tube	SAME AS 101			"	----		
X				* 115	High Voltage Supply Tube	Rectifier			B	866A/866		
X				* 116	High Voltage Supply Tube	SAME AS 115			"	----		

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

MODEL TCP-3

115 V AC	230 V DC	32 V DC	115 V DC		SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
							CAPACITORS - CLASS 48						
X	X	X	X	*	4	By-Pass Capacitor	Mica, .01 mfd., plus or minus 10% 1000 V D.C. Test			I	Type BE-1110		CA-177
X	X	X	X	*	9	Filter Capacitor	Paper, .1-.1-.1 mfd., plus or minus 10% 300 V D.C. Working			J	5239320-G1		CA-206
X	X	X	X		10	R.F. Tun. Capacitor (10 Used)	Var.Air, 100 mmfd., 500 V D.C. Test, 27 Plates			K	AP-9-100		CA-56
X	X	X	X	*	11	Conv. Tun. Capacitor (10 Used)	SAME AS 10			-	----		---
X	X	X	X	*	15	Coupling Capacitor	Mica, 100 mmfd., plus or minus 10% 500 V D.C. Working			I	K-1310		
X	X	X	X	*	16	Coupling Capacitor	SAME AS 15			-	----		
X	X	X	X	*	18	By-Pass Capacitor	SAME AS 15			-	----		
X	X	X	X	*	20	Coupling Capacitor	Mica, 200 mmfd., plus or minus 10% 500 V D.C. Working			I	K-1320		
X	X	X	X	*	26	By-Pass Capacitor	SAME AS 9			-	----		
X	X	X	X	*	29	By-Pass Capacitor	SAME AS 4			-	----		
X	X	X	X	*	32	By-Pass Capacitor	SAME AS 9			-	----		
X	X	X	X	*	50	Equalizing Capacitor	Mica, .004 mfd., plus or minus 10% 5000 V, D.C. Test			B	Model NF		CA-159
X	X	X	X	*	51	Coupling Capacitor	SAME AS 4			-	----		---
X	X	X	X	*	52	Coupling Capacitor	SAME AS 4			-	----		---
X	X	X	X	*	53	Volume Control Capacitor	Paper, .1 mfd., plus or minus 10% 200 V D.C. Working			AW	Type Z-282		CA-201
X	X	X	X	*	54	By-Pass Capacitor	SAME AS 15			-	----		---
X	X	X	X	*	55	By-Pass Capacitor	SAME AS 4			-	----		---
X	X	X	X	*	56	By-Pass Capacitor	Mica, 100 mmfd., plus or minus 10% 1000 V D.C. Test			I	Type BE-1110		CA-96
X	X	X	X	*	57	By-Pass Capacitor	SAME AS 56			-	----		---
X	X	X	X	*	58	By-Pass Capacitor	SAME AS 9			-	----		---
X	X	X	X	*	59	AVC Capacitor	SAME AS 4			-	----		---
X	X	X	X	*	62	Diode Capacitor	SAME AS 15			-	----		---
X	X	X	X	*	74	Filter Capacitor	Paper, 2 mfd., plus or minus 10% 600 V D.C. Working			J	5225569		CA-231
X	X	X	X	*	75	Filter Capacitor	Electrolytic, 24 mfd., plus or minus 20% 350 V D.C. Working			CX	SJ-174-D		CA-251
X	X	X	X	*	79	Bias Capacitor	Electrolytic, 25 mfd., plus or minus 20% 50 V D.C. Working			BK	EDJ-3250		CA-252
							INDICATING LAMPS						
X	X	X	X	*	81	Pilot Light	Mazda 40, 6.3 V, 0.15 Amps, Miniature Screw Base, Brown Bead			J	Type T-40		IA-5
							JACKS AND RECEPTACLES - CLASS 49						
X	X	X	X	*	12	Crystal Jack Assembly	Bakelite, for 10 Crystals			AH	KS-73		DWG KS-73

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

MODEL TCP-3

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47						
X	X	X	X	* 3	Ant. R. F. Transformer	Prim. Univ. Wound, 33 T, #31 SSC Enam. Sec. 58½ Turns 10/41 Litz, single layer			A	8012-B		
X	X	X	X	* 17	Osc. Cathode Choke	2.5 Millihenries, 125 m.a., 50 ohms			R	Type R-100		CH-13
X	X	X	X	* 19	Interstage R.F. Transformer	SAME AS 3			-	----		---
X	X	X	X	* 28	First I.F. Transformer	Prim. 7/41 Litz Univ. Wound, 330 Turns with tap at 60 Turns Sec. 7/41 Litz Univ. Wound 330 Turns			CU	Type 9900		TI-3
X	X	X	X	* 60	Second I.F. Transformer	SAME AS 28			-	----		---
X	X	X	X	* 61	Third I.F. Transformer	Prim. 7/41 Litz Univ. Wound, 330 Turns with tap at 150 Turns Sec. 7/41 Litz Univ. Wound, 330 Turns			CU	Type 9901		TI-4
						TRANSFORMERS AND REACTORS; POWER AND AUDIO - CLASS 30						
X	X	X	X	* 63	A. F. Output Transformer	Prim. to match plate circuit of 6V6GT/G tube - Case 2A Sec. 1 to match 4 ohm load Sec. 2 to match 200 ohm load			N	Type T-104		TA-18
X	X	X	X	* 72	Power Transformer	Prim. tapped for 100, 110, 120 V, 60 Cycle Sec. 1 250-0250 V A.C. for 80 m.a. D.C. Load Sec. 2 5 V, 2 Amp Sec. 3 tapped for 6.3 V, 3 amp			N	Type S-7961-B		TP-10
X	X	X	X	* 73	Rectifier Filter Reactor	30 henries, 90 m.a., 350 Ohms D.C., 1000 V A.C. Test			N	Type T-153		XL-18
						RESISTORS - CLASS 63						
X	X	X	X	* 5	Grid Resistors	100,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-234
X	X	X	X	* 6	Screen Resistor	25,000 Ohms, 1 W, Plus or minus 10%, Carbon			H	C-1		RE-213
X	X	X	X	* 7	Screen Resistor	10,000 Ohms, 2 W, plus or minus 10%, Metallized			G	Type BT-2		RE-194
X	X	X	X	* 8	Plate Resistor	2500 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-151
X	X	X	X	* 14	Grid Resistor	SAME AS 5			-	----		---
X	X	X	X	* 21	Grid Resistor	500,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-245
X	X	X	X	* 22	Plate Resistor	SAME AS 5			-	----		---
X	X	X	X	* 23	Screen Resistor	SAME AS 6			-	----		---
X	X	X	X	* 24	Screen Resistor	SAME AS 7			-	----		---
X	X	X	X	* 25	Plate Resistor	SAME AS 8			-	----		---
X	X	X	X	* 27	Grid Resistor	SAME AS 5			-	----		---
X	X	X	X	* 30	Screen Resistor	SAME AS 6			-	----		---
X	X	X	X	* 31	Screen Resistor	SAME AS 7			-	----		---
X	X	X	X	* 33	Plate Resistor	SAME AS 8			-	----		---
X	X	X	X	* 34	Cathode Resistor	500 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-108
X	X	X	X	* 35	AVC Resistor	SAME AS 21			-	----		---
X	X	X	X	* 36	Screen Resistor	SAME AS 6			-	----		---
X	X	X	X	* 37	Screen Resistor	SAME AS 7			-	----		---
X	X	X	X	* 38	Plate Resistor	SAME AS 8			-	----		---
X	X	X	X	* 39	Diode Resistor	50,000 ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-227
X	X	X	X	* 40	Diode Resistor	SAME AS 21			-	----		---
X	X	X	X	* 41	AVC Resistor	250,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-243

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209

Model TCP-3

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						RESISTORS - CLASS 63						
X	X	X	X	* 42	Coupling Resistor	SAME AS 5			-	----		---
X	X	X	X	* 43	Grid Resistor	1 Megohm, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-252
X	X	X	X	* 44	Plate Resistor	SAME AS 5			-	----		---
X	X	X	X	* 45	Grid Resistor	SAME AS 43			-	----		---
X	X	X	X	* 46	Grid Resistor	SAME AS 21			-	----		---
X	X	X	X	* 47	Plate Resistor	25,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		RE-215
X	X	X	X	* 48	Grid Resistor	SAME AS 5			-	----		---
X	X	X	X	* 49	Audio Limit Resistor	100 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-64
X	X	X	X	* 66	Ringer Resistor	50,000 Ohms, 2 W, plus or minus 10%, metallized			G	Type BT-2		RE-230
X	X	X	X	* 67	Ringer Resistor	SAME AS 66			-	----		---
X	X	X	X	* 68	Bias Limit Resistor	SAME AS 39			-	----		---
X	X	X	X	* 69	Volume Control Resistor	250,000 Ohms, plus or minus 10%, Type CS, Taper "A"(linear) Includes SPST switch 65, closed at extreme clockwise rotation			G	(250,000 V (5241-2268		
X	X	X	X	* 70	Isolating Resistor	5000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-171
X	X	X	X	* 76	Bias Resistor	125 Ohms, 1 W, plus or minus 10%, Carbon			H	C-1		RE-76
X	X	X	X	* 77	Bias Resistor	SAME AS 76			-	----		---
X	X	X	X	* 78	Bias Resistor (2 Used)	SAME AS 76 (connected in parallel)			-	----		---
						SWITCHES - CLASS 24						
X	X	X	X	* 13	Receiver Freq. Switch	3 Gang, 10 Position			CG	22290-H3C		SW-68
X	X	X	X	* 71	Volume Switch	Single Pole, Double Throw			CD	Type 21350		SW-11
						VACUUM TUBES - CLASS 38						
X	X	X	X	* 103	R. F. Amplifier Tube	Pentagrid Mixer Amplifier			B	Type 6L7		
X	X	X	X	* 104		SAME AS 103			-	----		
X	X	X	X	* 105	First I.F. Amplifier Tube	SAME AS 103			-	----		
X	X	X	X	* 106	Second I.F. Amplifier Tube	SAME AS 103			-	----		
X	X	X	X	* 107	Detector - 1st Aud. Amp. Tube	Duo Diode Triode (2nd Detector)			B	Type 6R7		
X	X	X	X	* 108	Audio Output Tube	Beam Power Amplifier			B	Type 6V6GT/G		
X	X	X	X	* 109	Oscillator Tube	Triode Amplifier Oscillator			B	Type 6J5		
X	X	X	X	* 110	Rectifier Tube	Full Wave High Vacuum Rectifier			B	Type 5W4		
X	X	X	X	* 111	Ringer Amplifier Tube (not used in TCP-3)	SAME AS 109			-	----		
						LOUD SPEAKER - CLASS 49						
X	X	X	X	64	Loud Speaker	Permanent Magnet Moving Coil, 3" Cone			CS	30-OM-9A		LSR-1

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

Model TCP-3

SECTION 3 - HAND TELEPHONE ASSEMBLY PARTS ONLY - REFERENCE DRAWING T-1209
CRM-51026

115 V AC	230 V DC	32 V DC	115 V DC		SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
X	X	X	X		1	Handset (with cord)	Combination Microphone, Telephone Receiver and Press-to-Talk Push Button			BF	F3-AW-3		HA-1
X	X	X	X	*	2	Switch Hook Assembly	1 Single Pole double throw, 2 single pole single throw contact springs			BF	Type G2-3		SW-14
X	X	X	X	*	3	Equalizing Resistor	500 ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-108
X	X	X	X	*	4	Equalizing Resistor	SAME AS 3			-	----		---
X	X	X	X	*	5	Push Button Resistor	10,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-190
X	X	X	X		6	Hand Telephone Ass. Cable	10 Ft. 7 Cond. Cable, Color Coded, Shielded & Rubber Covered			BM	Stype 8012-B		

SECTION 4 - REMOTE CONTROL UNIT PARTS ONLY - REFERENCE DRAWING T-1209
CRM-23230

X	X	X	X		1	Handset	Combination Microphone, Telephone Receiver and Press-to-Talk Push Button			BF	F3-AW-3		HA-1
X	X	X	X	*	2	Switch Hook Assembly	1 Single Pole double throw, 2 single pole single throw contact springs			BF	Type G2-3		SW-14
X	X	X	X	*	3	Equalizing Resistor	500 ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-108
X	X	X	X	*	4	Equalizing Resistor	SAME AS 3			-	----		---
X	X	X	X	*	5	Push Button Resistor	10,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-190
X	X	X	X	*	6	Volume Switch	Single Pole, double throw			CD	Type 21350		SW-11
X	X	X	X	*	7	Volume Control	5000 Ohms, plus or minus 10%, Variable, Type CS, Taper "A" (linear)			G	(5000 VC (5636-2308		
X	X	X	X		8	Loud Speaker	Permanent Magnet moving coil, 3" Cone			GS	30-[illegible]M-9A		LSR-1
					9	Bell (not used with TCP-3)	5 Volt A.C.			BF	Type 156		BL-1

SECTION 5 - LINE FILTER PARTS ONLY - REFFRENCE DRAWING T-1209
CRM-53085 - 32 VOLTS D.C.
CRM-53086 - 115 VOLTS D.C.
CRM-53192 - 230 VOLTS D.C.

		X			1	Line Filter Choke	2 Sections, each sect. 20 turns #10 AWG			L	Type 3230		CH-1
	X		X		1	Line Filter Choke	2 Sections, each sect. 30 turns #12 AWG			L	Type Z-22		CH-4
		X			2	Line Filter Choke	SAME AS 1			-	----		---
	X		X		2	Line Filter Choke	SAME AS 1			-	----		---
	X	X	X	*	3	Line Switch	Double Pole, Single Throw			J	269846		SW-45
	X	X	X	*	4	Filter Capacitor	Mica, .01 mfd., plus or minus 10%, 2500 V D.C. Test			B	Model NF		
	X	X	X	*	5	Filter Capacitor	SAME AS 4			-	----		
		X		*	6	Line Fuse	60 Amp, 250 V, Renewable 3" Cartridge			C	Standard		FS-30
			X	*	6	Line Fuse	30 Amp, 250 V, Renewable 2" Cartridge			C	Standard		FS-25
	X			*	6	Line Fuse	20 Amp, 250 V, Renewable 2" Cartridge			C	Standard		
		X		*	6a	Line Fuse Link	60 Amp, 250 V			C	Standard		FL-15
			X	*	6a	Line Fuse Link	30 Amp, 250 V			C	Standard		FL-10
	X			*	6a	Line Fuse Link	20 Amp, 250 V			C	Standard		

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 6 - MISCELLANEOUS PARTS ONLY - REFERENCE DRAWING (NONE)

CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.
CRM-43061 - 230 VOLTS D.C.
CRM-43062 - 115 VOLTS, 1 PHASE, 50/60 CYCLES

115 V AC	230 V DC	32 V DC	115 V DC	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
X	X	X	X	* 1	Vacuum Tube Socket (2 Used)	4 Prong Mycalex Insulation			AS	4 Prong Spec.		SKT-6
X	X	X	X	* 2	Vacuum Tube Socket (5 used)	5 Prong Mycalex Insulation			AS	5 Prong Spec.		SKT-11
X	X	X	X	* 3	Vacuum Tube Socket (3 Used)	7 Prong Phenolic Insulation			AH	12-DNO		SKT-17
X	X	X	X	* 4	Vacuum Tube Socket (9 Used)	8 Prong Ceramic Insulation			R	CIR		SKT-23
X				* 5	Vacuum Tube Socket (2 Used)	4 Prong, UX, shell			AO	#210		
X	X	X	X	* 6	Sliders (4)	For Rotating R. F. Inductors			A	----------		
X	X	X	X	* 7	Plate Leads (1 Set of 5)	With #91 Alden Caps			A	----------		
X	X	X	X	* 8	Plate Leads (1 Set of 2)	With #12 National Clips			A	----------		
X				* 9	Plate Leads (1 Set of 2)	With #12 National Clips			A	----------		
X	X	X	X	* 10	Cable (4'0")	4 Conductor Cable			BF	H4J4		
X	X	X	X	* 11	Shock Mounts (4)	Lord Type 200-XPH-75			EN	200-XPH-75		
X	X	X	X	* 12	Insulator (6)	Alsimag Insulator			P	1647		
X	X	X	X	* 13	Insulator (1)	Alsimag Insulator			P	1005		
X	X	X	X	* 14	Insulator (1)	Alsimag Insulator			P	S-1186		
X	X	X	X	* 15	Insulator (1)	Cone Insulator			R	GS-10		

*SPARE PARTS FURNISHED; For actual quantity of spare parts, refer to table IV

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote Control Parts
(S5) are Line Filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
						CAPACITORS - CLASS 48
X	X	X	X	1		(S1) 4
x	x	x	x	1		(S1) 5
x	x	x	x	1		(S1) 6
x	x	x	x	1		(S1) 9
x	x	x	x	2		(S1) 10, 14
x	x	x	x	3)		(S1) 15, 31, 32
	X	x	x	2)		(S5) 4, 5
x	x	x	x	1		(S1) 19
x	x	x	x	1		(S1) 24
x	x	x	x	1		(S1) 25
x	x	x	x	1		(S1) 30
x	x	x	x	1		(S1) 35
x	x	x	x	1		(S1) 36
x	x	x	x	1		(S1) 45 -(S1)85a, 85b and 87a are in Rot. Eqpt.-
x	x	x	x	4		(S1) 59, 66, 67, 69
x	x	x	x	1		(S1) 68
	x	x	x	3)		(S1) 79, 80, 81
x	x	x	x	1)		(S1) 88
x				1		(S1) 114
x	x	x	x	6		(S2) 4, 29, 51, 52, 55, 59
x	x	x	x	4		(S2) 9, 26, 32, 58
x	x	x	x	2		(S2) 10, 11
x	x	x	x	5		(S2) 15, 16, 18, 54, 62
x	x	x	x	1		(S2) 20
x	x	x	x	1		(S2) 50
x	x	x	x	1		(S2) 53
x	x	x	x	2		(S2) 56, 57
x	x	x	x	1		(S2) 74
x	x	x	x	1		(S2) 75
x	x	x	x	1		(S2) 79
						-(S1)85c is in Rotating Equipment.-
						MOTOR GENERATOR AND ROTARY CONVERTER - CLASS 21
		x		1		(S1) 85
			x	1		(S1) 85
	x			1		(S1) 85
		x		1		(S1) 87
			x	1		(S1) 87
	x			1		(S1) 87

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote Control parts
(S5) are Line Filter parts
(S6) are Miscellaneous parts.

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
						MOTOR GENERATOR STARTER- CLASS 21
	X			1		(S1) 86
		x		1		(S1) 86
x				1		(S1) 86
						FUSES - CLASS 28
x				1)		(S1) 105
		x		1)		(S1) 72
	x					(S1) 72,
x				1		(S1) 72
	x			1		(S1) 73
x		x		1		(S1) 73
	x			1		(S1) 73
x	x	x	x	1		(S1) 74
	x	x	x	1)		(S1) 75
x				1)		(S1) 104
	x			1		(S5) 6
		x		1		(S5) 6
	x			1		(S5) 6
						FUSE LINKS
x				1)		(S1) 105a
		x		1)		(S1) 72a
	x			1		(S1) 72a
	x			1		(S1) 72a
		x		1		(S5) 6a
		x		1		(S5) 6a
	x			1		(S5) 6a
						INDICATING LAMPS
x	x	x	x	2		(S1) 18, (S2) 81
						JACKS AND RECEPTACLES - CLASS 49
x	x	x	x	2		(S1) 40, (S2) 12
						RELAYS - CLASS 29
x	x	x	x	1		(S1) 49
x				1		(S1) 106
x				1		(S1) 107

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line Filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
						R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47
x	x	x	x	1		(S1) 1
X	X	X	X	1		(S1) 8
x	x	x	x	3)		(S1) 11, 20, 34
x				1)		(S1) 103
x	x	x	x	1		(S1) 13
x	x	x	x	1		(S1) 26
		x		3		(S1) 76, (S5) 1, 2
	x		x	3		(S1) 76, (S5) 1, 2
	x	x	x	2		(S1) 77, 78
x	x	x	x	2		(S2) 3, 19
x	x	x	x	1		(S2) 17
x	x	x	x	2		(S2) 28, 60
x	x	x	x	1		(S2) 61
						TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30
		x		1		(S1) 53
			x	1		(S1) 53
	x			1		(S1) 53
x				1		(S1) 53
x	x	x	x	1		(S1) 54
x	x	x	x	1		(S1) 55
x	x	x	x	1		(S1) 56
x	x	x	x	1		(S1) 57
x	x	x	x	1		(S1) 58
x	x	x	x	1		(S2) 63
x	x	x	x	1		(S2) 72
x	x	x	x	1		(S2) 73
x				1		(S1) 108
x				1		(S1) 109
x				1		(S1) 110
						METERS - CLASS 22
x	x	x	x	1		(S1) 2
x	x	x	x	1		(S1) 47

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by (S1) are transmitter parts, (S2) are receiver parts, (S3) are Hand Telephone Ass. Parts, (S4) are Remote Control parts, (S5) are Line Filter parts, (S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
						RESISTORS - CLASS 63
x	x	x	x	1		(S1) 3
x	x	x	x	3		(S1) 12, 21, 64
x	x	x	x	4		(S1) 16, 17, 27, 28
x	x	x	x	2		(S1) 22, 50
x	x	x	x	7)		(S1) 23, 91, (S2) 7, 24, 31, 37
			x	1)		(S1) 86b
x	x	x	x	1		(S1) 29
x	x	x	x	1		(S1) 33
x	x	x	x	5		(S1) 37, (S2) 6, 23, 30, 36
x	x	x	x	2		(S1) 38 (S2) 49
x	x	x	x	1		(S1) 41
x	x	x	x	2		(S1) 42, 90
x	x	x	x	2		(S1) 43, 44
x	x	x	x	2)		(S1) 51, (S2) 47
x				1)		(S1) 111
x	x	x	x	1		(S1) 52
x	x	x	x	3		(S1) 60, (S2) 39, 68
x	x	x	x	1		(S1) 61
x	x	x	x	1		(S1) 62
x	x	x	x	1		(S1) 63
x	x	x	x	1		(S1) 65
x	x	x	x	1		(S1) 70
		x		1		(S1) 86b
	x			1		(S1) 86b
x	x	x	x	6		(S1) 89, (S2) 34, (S3) 3, 4, (S4) 3, 4
x	x	x	x	7		(S2) 5, 14, 22, 27, 42, 44, 48
x	x	x	x	4		(S2) 8, 25, 33, 38
x	x	x	x	4		(S2) 21, 35, 40, 46
x	x	x	x	2		(S3) 5, (S4) 5
x	x	x	x	1		(S2) 41
x	x	x	x	2		(S2) 43, 45
x	x	x	x	2		(S2) 66, 67
x	x	x	x	1		(S2) 69
x	x	x	x	1		(S2) 70
x	x	x	x	3		(S2) 76, 77, 78
x	x	x	x	1		(S4) 7
x				1		(S1) 112
x	x	x	x	1		(S1) 113

-(S1)86a is part of Motor Generator Starter

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote Control Parts
(S5) are Line Filter Parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
						SWITCHES- CLASS 24
x	x	x	x	1		(S1) 7
x	x	x	x	1		(S1) 39
x	x	x	x	1		(S1) 46
x	x	x	x	1		(S1) 48
x	x	x	x	1		(S1) 71
x	x	x	x	3		(S1) 92, (S2) 71, (S4) 6.
x	x	x	x	1		(S2) 13
x	x	x	x	2		(S3) 2, (S4) 2.
	x	x	x	1		(S5) 3
						VACUUM TUBES - CLASS 38
x	x	x	x	5		(S1) 93, 94, 95, 96, 97
x	x	x	x	3		(S1) 98, 99, 100
x	x	x	x	2		(S1) 101, 102
x	x	x	x	4		(S2) 103, 104, 105, 106
x	x	x	x	1		(S2) 107
x	x	x	x	1		(S2) 108
x	x	x	x	2		(S2) 109, 111 (111 Not Used in TCP-3)
x	x	x	x	1		(S2) 110
x				2		(S1) 115, 116
						VACUUM TUBE SOCKETS
x	x	x	x	2		(S6) 1
x	x	x	x	5		(S6) 2
x	x	x	x	3		(S6) 3
x	x	x	x	9		(S6) 4
x				2		(S6) 5
						LOUD SPEAKER - CLASS 49
x	x	x	x	2		(S2) 64, (S4) 8
						HANDSET
x	x	x	x	2		(S3) 1, (S4) 1
						BELL
x	x	x	x	1		(S4) 9 (Not Used in TCP-3

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc.
Symbol designations preceded by (S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote Control Parts
(S5) are Line Filter Parts
(S6) are Miscellaneous Parts

EXAMPLE: (S1) 4 is same symbol 4. in section I, Table II.

115 V AC	230 V AC	32 V DC	115 V DC	QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
						SLIDERS, LEADS, CABLE, SHOCK MOUNTS AND INSULATORS
x	x	x	x	4		(S6) 6
x	x	x	x	1(Set of 5)		(S6) 7
x	x	x	x	1(Set of 2)		(S6) 8
x				1(Set of 2)		(S6) 9
x	x	x	x	1(4'0")		(S6) 10
x	x	x	x	4		(S6) 11
x	x	x	x	6		(S6) 12
x	x	x	x	1		(S6) 13
x	x	x	x	1		(S6) 14
x	x	x	x	1		(S6) 15

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

MODEL TCP-3

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						CAPACITORS - CLASS 48						
X	X	X	X	1	(S1) 4	Mica, .0015 mfd., plus or minus 10% 2500 V D.C. Working			I	A2-5215		
X	X	X	X	1	(S1) 5	Mica, .0002 mfd., plus or minus 10%			I	Type C	3000 V D.C. Test	CA-108
X	X	X	X	1	(S1) 6	Mica, .0001 mfd., plus or minus 10%			I	Type C	3000 V D.C. Test	CA-98
X	X	X	X	1	(S1) 10, 14	Mica, .002 mfd., plus or minus 10% 5000 V D.C. Test			B	Model NF		CA-146
X	X	X	X	2	((S1)15,31,32, (S5)4,5	Mica, .01 mfd., plus or minus 10%						
X					((S1) 15,31,32	2500 V D.C. Test			B	Model NF		CA-181
X	X	X	X	1	(S1) 19	Mica, .02 mfd, plus or minus 10% 1000 V D.C. Test			B	Model NF		CA-197
X	X	X	X	1	(S1) 24	Mica, .00005 mfd., plus or minus 10% 5000 V D.C. Test			B	Model NF		CA-93
X	X	X	X	1	(S1) 35	Mica, 24 mmfd., plus or minus 10% 500 V D.C. Working			I	K-1424		
X	X	X	X	1	(S1) 36	Mica, .00025 mfd., plus or minus 10% 5000 V D.C. Test			B	Model NF		CA-115
X	X	X	X	1	(S1) 45 (see 85a, 85b and (87a under Rot.Eqpt)	Mica, .01 mfd., plus or minus 10% 1000 V D.C. Test			I	B-1110		CA-175
X	X	X	X	2	(S1)59, 66, 67, 69	Paper, 4 mfd., plus 10% minus 2½% 600 V D.C. Working			J	9CE5A24		CA-236
x	x	x	x	1	(S1) 68	Paper, 10 mfd., plus 10% minus 2½% 600 V D.C. Working			J	9CE5A28		CA-246
	X	X	X	4	((S1) 78, 80, 81, 88	Paper, .1 mfd., plus 10% minus 2½%						
X				1	((S1) 88	1000 V D.C. Working			J	9CE6A14		CA-202
X				2	(S1) 114	Paper, 4 mfd., plus 10% minus 2½% 1000 V D.C. Working			J	9CE5A33		
X	X	X	X	2	(S2) 4, 29, 51, 52, 55, 59	Mica, .01 mfd., plus or minus 10% 1000 V D.C. Test			I	Type BE-1110		CA-177
X	X	X	X	2	(S2) 9, 26, 32, 58	Paper, .1-.1-.1 mfd, plus or minus 10% 300 V D.C. Working			J	5239320-G1		CA-206
X	X	X	X	1	(S2) 15, 16, 18, 54, 62	Mica, 100 mmfd., plus or minus 10% 500 V D.C. Working			I	K-1310		
X	X	X	X	1	(S2) 20	Mica, 200 mmfd., plus or minus 10% 500 V D.C. Working			I	K-1320		
X	X	X	X	1	(S2) 50	Mica, .004 mfd., plus or minus 10%			B	Model NF		CA-159
X	X	X	X	1	(S2) 53	Paper, .1 mfd., plus or minus 10% 200 V D.C. Working			AW	Type Z-282		CA-201
X	X	X	X	1	(S2) 56, 57	Mica, 100 mmfd., plus or minus 10% 1000 V D.C. Test			I	Type BE-1110		CA-96
X	X	X	X	1	(S2) 74	Paper, 2 mfd., plus or minus 10% 600 V D.C. Working			J	5225569		CA-231
X	X	X	X	1	(S2) 75	Electrolytic, 24 mfd., plus or minus 20% 350 V D.C. Working			CX	SJ-174-D		CA-251
X	X	X	X	1	(S2) 79	Electrolytic, 25 mfd., plus or minus 20% 50 V D.C. Working			BK	EDJ-3250		CA-252

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
					MOTOR GENERATOR AND ROTARY CONVERTER - CLASS 21 Including Bearings, Brushes, Capacitors, etc.							
		X		1	(S1) 85 Trans. M.G.	See page 6 Inst. Book for complete rating			BO	SS-2049		MG-2
			X	1	(S1) 85 Trans. M.G.	See Page 6 Inst. Book for complete rating			S	ET-8012-D-115		MG-4
	X			1	(S1) 85 Trans. M.G.	See Page 6 Inst. Book for complete rating			S	ET-8012-D-230		MG-24
	X	X	X	1	Trans. M.G. Bearings	For SS-2049, ET-8012-D-115 or ET-8012-D-230			DL	8502 or WC-8502		
	X		X	5	Motor Brushes for M.G.	2 Brushes with springs and caps, 1/2 X 3/8 X 7/8 Long - Grade HM-6782			S	See Descrip.		
		X		5	Motor Brushes for M.G.	2 Brushes with springs and caps 1/2 X 3/8 X 7/8 Long - Grade CM-9			BO	See Descrip .		
	X	X	X	5	H.V.Gen. Brushes for M.G.	2 Brushes with springs and caps, 3/8 X 1/8 X 5/8 Long - Grade HM- 6165			BO & S	See Descrip.		
	X	X	X	5	Coll.Ring Brushes for M.G.	2 Brushes with springs and caps 1/2 X 1/4 X 7/8 Long - Grade AY			BO & S	See Descrip.		
	X	X	X	2	(S1)85a, 85b, 87a (Capacitors)	Mica, .01 mfd, plus or minus 10%, 1000 V D.C. Test			I	B-1110		CA-175
	X	X	X	1	(S1)85c (Capacitor)	Mica, .01 mfd, plus or minus 10%, 2500 V D.C. Test			I	H-2110		CA-
	X	X	X	1	Shock Mounts for M.G.	Lord Type 200-PH-25			EN	200-PH-25		
		X		1	(S1) 87 Rec. Rot. Conv.	See Page 5 Inst. Book for complete rating			BO	SS-3021		CVR-14
			X	1	(S1) 87 Rec. Rot. Conv.	See Page 5 Inst. Book for complete rating			BO	SS-3020		CVR-16
	X			1	(S1) 87 Rec. Rot. Conv.	See Page 5 Inst. Book for complete rating			BO	SS-3073		CVR-18
	X	X	X	1	Rec. Rot. Conv. Bearings	For SS-3021, SS-3020 or SS-3073			DL	8502 or WC-8502		
	X	X	X	5	Motor Brushes for Rot.Conv.	2 Brushes with springs and caps, 3/8 X 1/2 X 7/8 Long - Grade HM-6782			BO	See Descrip.		
	X	X	X	5	Motor Brushes for Rot.Conv.	2 Brushes with springs and caps, 3/8 X 1/2 X 7/8 Long - Grade XMM			BO	See Descrip.		
	X	X	X	5	Gen. Brushes for Rot. Conv.	2 Brushes with springs and caps, 1/2 X 1/4 X 7/8 Long - Grade HM-6782			BO	See Descrip.		
	X	X	X	1	(S1)87b Filt. Unit for Rot. Conv.	Complete Filter Unit for SS-3021, SS-3020 or SS-3073			BO	See Descrip.		
					MOTOR GENERATOR STARTER - CLASS 21 Including Contacts & Springs, Coils and Resistors, etc.							
	X	X	X		(S1) 86b Resistors (Furnished with Transmitter-Receiver Resistors)				-	---		
		X		1	Motor Starter Coil	Starter Coil for Cat. 6932935-G-15			J	22D104-G3		
			X	1	Motor Starter Coil	Starter Coil for Cat. 6932935-G-16			J	22D104-G1		
	X			1	Motor Starter Coil	Starter Coil for Cat. 6934846-G-7			J	22D104-G2		
		X		1	(S1)86a Resistors	Set of 2 - 1.6 Ohms and .7 Ohms			J	2229471-G6-G7		
			X	1	(S1)86a Resistors	Set of 2 - 3 Ohms and 2.25 Ohms			J	2229471-G15-G1		
	X			1	(S1)86a Resistors	Set of 2 - 12.5 Ohms and 10 Ohms			J	2229471-G12-G8		
		X		1	Overload Heater Element	Metallic Strip "T" shaped 38.8-43.5 Amp			J	81D266		
			X	1	Overload Heater Element	Metallic Strip "T" shaped 11.1-11.8 Amp			J	81D254		
	X			1	Overload Heater Element	Metallic Strip "T" shaped 6.2-6.8 Amp			J	81D264		
	X	X	X	1	Compression Spring for Cut-out Switch Operating Lever	Metallic Spring 7/8 L X 7/16 Diam.			J	2411353		

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

MODEL TCP-3

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
					MOTOR GENERATOR STARTER - CLASS 21 (Cont'd) Including Contacts & Springs, Coils and Resistors, etc.							
	X	X	X	3	Movable Contact Tip (Line or Accelerating)	Metallic Strip 1-3/4 X 1/2 X 3/16			J	6978682-G1		
	X	X	X	2	Stationary Accel. Contact	Metallic Strip "U" shaped with 3 holes			J	6978682-G3		
	X	X	X	1	Stationary Line Contact	Metallic Bar with 2 holes at ends			J	5346447-G4		
	X	X	X	1	Movable Contact for Cut-out Switch	Flat Metallic Strip with contacts at ends (side)			J	5344049-G1		
	X	X	X	2	Stat. Cutout Sw. Contact				J	2810484-G1		
	X	X	X	1	Stationary Holding Cutout Switch Contact	1/2" Metallic Strip bent in the form of a "V" with contact at one end. Mounting Hole at other end			J	5344052-G1		
	X	X	X	1	Operating Lever for Cutout Switch	Operating Lever with holding movable contact			J	5344053-G1		
	X	X	X	3	Compression Spring	Compression Spring for Line or Accelerating Contacts			J	246116		
	X	X	X	1	Torsion Spring for Clutch	Torsion Spring 15/16 L X 11/16 Diam.			J	2415678		
	X	X	X	1	Set of Flexible Leads (Shunt)	Bare Stranded wires 6-1/2" long with 5 screw type lugs			J	5344070-G1		
					FUSES - CLASS 28							
		X		2	(S1) 72	250 V, 15 Amp, 2" Renewable Cartridge			C	Standard		FS-19
X			X	2	(S1)105 AC, (S1)72 DC	250 V, 10 Amp, 2" Renewable Cartridge			C	Standard		FS-17
	X			2	(S1) 72	250 V, 6 Amp, 2" Renewable Cartridge			C	Standard		
		X		10	(S1) 73	25 V, 10 Amp, Glass, 1-1/4" Long			D	3-AG #1081		FS-16
X			X	10	(S1) 73	250 V, 3 Amp, Glass, 1-1/4" Long			D	3-AG #1043		FS-10
	X			10	(S1) 73	250 V, 2 Amp, Glass, 1-1/4" Long			D	3-AG #1042		
X	X	X	X	20	(S1) 74	3000 V, .75 Amp, 5-7/16" Long			D	#2113		FS-6
X	X	X	X	20	(S1) 75 DC Sets, 104 AC Sets	250 V, 1 Amp, Glass, 1-1/4" Long			D	3-AG 1040		FS-7
		X		2	(S5) 6	250 V, 60 Amp, Renewable 3" Cartridge			C	Standard		FS-30
			X	2	(S5) 6	250 V, 30 Amp, Renewable 2" Cartridge			C	standard		FS-25
	X			2	(S5) 6	250 V, 20 Amp, Renewable 2" Cartridge			C	Standard		
					FUSE LINKS							
		X		10	(S1) 72a	250 V, 15 Amp			C	Standard		
X			X	10	(S1) 105a AC, (S1)72a DC	250 V, 10 Amp			C	Standard		
	X			10	(S1) 72a	250 V, 6 Amp			C	Standard		
		X		10	(S5) 6a	250 V, 60 Amp			C	Standard		
			X	10	(S5) 6a	250 V, 30 Amp			C	standard		
	X			10	(S5) 6a	250 V, 20 Amp			C	Standard		
					INDICATING LAMPS							
X	X	X	X	4	(S1) 18, (S2) 81	Mazda 40, 6.3 V, 0.15 Amps Miniature Screw Base, Brown Bead			J	Type T-40		LA-5
					JACKS AND RECEPTACLES - CLASS 49							
X	X	X	X	2	(S1) 40, (S2) 12	Bakelite, for 10 Crystals			AH	KS-73		Dwg KS-73

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

MODEL TCP-3

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						RELAYS - CLASS 29						
X	X	X	X	1	(S1) 49	Double Pole Double Throw, 5000 Ohm Coil			BZ	Type A-1662		RL-33
X				1	(S1) 106	DPST, 115 V A.C., 110 Ohm Coil			CJ	#6104		
X				1	(S1) 107	SPDT, 5 m.a. D.C., 3200 Ohm Coil			E	CXB-2126		
						R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47						
X	X	X	X	1	(S2) 3, 19	Prim. Univ. Wound, 33 T, #31 SSC Enam. Sec. 58½ Turns 10/41 Litz, single layer			A	8012-B		
X	X	X	X	1	(S2) 17	2.5 Millihenries, 125 m.a., 50 ohms			R	Type R-100		CH-15
X	X	X	X	1	(S2) 28, 60	Prim. 7/41 Litz Univ. Wound, 330 Turns with tap at 60 Turns Sec. 7/41 Litz Univ. Wound 330 Turns			CU	Type 9900		TI-3
X	X	X	X	1	(S2) 61	Prim. 7/41 Litz Univ. Wound, 330 Turns with tap at 150 Turns Sec. 7/41 Litz Univ. Wound, 330 Turns			CU	Type 9901		TI-4
						TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30						
		X		1	(S1) 53	Prim. 18, 20 & 22 Volts. - 60 Cycles- Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps) Sec. 2 - 6.3 Volts, 7.4 Amps, C.T.) 2500 V A.C. Test			N	Type S-8074		TP-3
			X	1	(S1) 53	Prim. 68, 75, 82 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps) Sec. 2 - 6.3 Volts, 7.4 Amps - C.T.) 2500 V A.C. Test			N	Type S-8059		TP-4
	X			1	(S1) 53	Prim. 136, 150, 164 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps) Sec. 2 - 6.3 Volts, 7.4 Amps - C.T.) 2500 V A.C. Test			N	Type S-11314		
X				1	(S1) 53	Prim. 110, 115, 120 Volts. - 60 Cycles - Case 5A Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps Sec. 2 - 6.3 Volts, 7.4 Amps, C.T.			N	Type S-12591		
X	X	X	X	1	(S1) 54	Prim. to match plate to plate load of two 809 tubes - Case 5A Sec. to modulate class "C" load of 550 V, 300 m.a. D.C.			N	Type T-494-A		TA-7
X	X	X	X	1	(S1) 55	Prim. to match plate to plate load of 6A6 Tube - Case 3A Sec. to match grids of two 809 tubes			N	Type T-264-A		TA-12
X	X	X	X	1	(S1) 56	Prim. to match parallel plates of 6A6 Tube - Case 2A Sec. to match grids of 6A6 tubes			N	Type T-251		TA-9
X	X	X	X	1	(S1) 58	D.C. Resistance 10 Henries, 200 m.a. D.C. max., 200 Ohms D.C. 1000 V A.C. Test - Case 3A			N	Type T-152		XL-13
X	X	X	X	1	(S1) 57	Prim. to match carbon microphone - Case 1A Sec. to match parallel grids of 6A6 Tube			N	Type T-1		TA-2
X				1	(S1) 108	Prim. 110, 115 & 120 Volts. - 60 Cycles - Case 3A Sec. 2.5 Volts, 10 Amps, C.T.			N	S-12590		
X				1	(S1) 109	Prim. 110, 115 & 120 Volts. - 60 Cycles - Case 8A Sec. 720-0-720 Volts, 500 m.a. D.C.			N	S-12589		
X				1	(S1) 110	7 Henries, 70 Ohms, 700 m.a. D.C. - Case 7A (2 Used)			N	S-12592		

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

MODEL TCP-3

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30 (Cont'd)						
X	X	X	X	1	(S2) 63	Prim. to match plate circuit of 6V6GT/G tube - Case 2A Sec. 1 to match 4 ohm load Sec. 2 to match 200 ohm load		N		Type T-104		TA-18
X	X	X	X	1	(S2) 72	Prim. tapped for 100, 110, 120 V, 60 Cycle Sec. 1 250-0-250 V A.C. for 80 m.a. D.C. Load Sec. 2 5 V, 2 Amp Sec. 3 tapped for 6.3 V, 3 amp		N		Type S-7961-B		TP-10
X	X	X	X	1	(S2) 73	30 henries, 90 m.a., 350 Ohms D.C., 1000 V A.C. Tes		N		Type T-153		XL-18
						RESISTORS - CLASS 63						
X	X	X	X	1	(S1) 3	2 Megohms, 1 W, Plus or minus 10%, Carbon			H	C-1		RE-257
X	X	X	X	4	(S1) 12, 21, 64	5000 Ohms, 5 W, Plus or minus 10%, Carbon			H	Type D5ST2		RE-183
X	X	X	X	5	(S1) 16, 17, 27, 28	15 Ohms, 5W, plus or minus 10%, Wire Wound			G	Type AA-3-B(PW-2003)		RE-129
X	X	X	X	1	(S1) 22, 50	25 Ohms, 5 W, plus or minus 5%, Wire Wound			G	Type AA-3-B		RE-45
X	X	X	X	4	(S1)23,91,(S2)7,24,31,37)							
			X		(S1)86b)	10,000 Ohms, 2 W, plus or minus 10%, Metallized			G	Type BT-2		RE-194
X	X	X	X	1	(S1) 29	100,000 Ohms, 2 W, Plus 0, minus 20%, Metallized			G	Type BT-2		RE-235
X	X	X	X	1	(S1) 33	20,000 Ohms, 2 W, minus 0, plus 20%, Carbon			H	C-2		RE-208
X	X	X	X	3	(S1)37, (S2)6, 23, 30, 36	25,000 Ohms, 1 W, plus or minus 10%, Carbon			H	C-1		RE-214
X	X	X	X	1	(S1) 38, (S2) 49	100 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-64
X	X	X	X	1	(S1) 41	2 Ohms, 5 W, plus or minus 5%, Wire Wound			G	Type AA-3-B		RE-10
X	X	X	X	1	(S1) 42, 90	50,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		RE-230
X	X	X	X	1	(S1) 43, 44	0.22 Ohms, plus or minus 5%, Wire Wound			AT	Type 1-FX		RE-1
X	X	X	X	1 *	(S1) 51, (S2) 47	25,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		RE-215
X	X	X	X	1	(S1) 52	50,000 Ohms, plus or minus 10%, Variable Type CS, Taper "E"			G	(50,000 E (VC 9058-4062		
X	X	X	X	2	(S1) 60, (S2) 39, 68	50,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-227
X	X	X	X	1	(S1) 61	750 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-126
X	X	X	X	1	(S1) 62	40,000 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-225
X	X	X	X	1	(S1) 63	200 Ohms, 5 W, Plus or minus 10%, Carbon			H	Type D5ST2		RE-80
X	X	X	X	2	(S1) 65	10,000 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		RE-196
X	X	X	X	1	(S1) 70	1000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-133
X	X	X	X	3	(S1)89, (S2)34, (S3) 3,4, (S4)3, 4	500 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-108
X				1	(S1) 112	500,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		
X	X	X	X	1	(S1) 113	1 Ohm, .75 watt, plus or minus 1%, wire wound			AT	L-2822		
X	X	X	X	3	(S2) 5, 14, 27, 42, 44, 48	100,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-234
X	X	X	X	2	(S2) 8, 25, 33, 38	2500 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-151
X	X	X	X	2	(S2) 21, 35, 40, 46	500,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-245
X	X	X	X	1	(S2) 41	250,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-243
X	X	X	X	1	(S2) 43, 45	1 Megohm, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-252
X	X	X	X	1	(S2) 66, 67	50,000 Ohms, 2 W, plus or minus 10%, metallized			G	Type BT-2		RE-
X	X	X	X	1	(S2) 69	250,000 Ohms, plus or minus 10%, Type CS, Taper "A"(linear) Includes SPST switch 65, closed at extreme clockwise rotation			G	(250,000 V (5241-2268		
X	X	X	X	1	(S2) 70	5000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-171
X	X	X	X	2	(S2) 76, 77, 78	125 Ohms, 1 W, plus or minus 10%, Carbon			H	C-1		RE-76
X				1 *	(S1)111 (2 Used)	25,000 Ohms, 2 W, plus or minus 10%, Carbon			H	C-2		RE-215

* Two of these resistors furnished with A.C. Sets

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

MODEL TCP-3

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						RESISTORS - CLASS 63 (Cont'd)						
		X		1	(S1) 86b	2000 Ohms, 2 W, plus or minus 10%, Metallized			G	Type BT-2		RE-148
	X			1	(S1) 86b	20,000 Ohms, 5 W, plus or minus 10%, Carbon			H	Type D5ST2		
X	X	X	X	2	(S3) 5, (S4) 5	10,000 Ohms, 1/2 W, plus or minus 10%, Carbon			AU	EB		RE-190
X	X	X	X	1	(S4) 7	5000 Ohms, plus or minus 10%, Variable Type CS, Taper "A" (linear)			G	(5000 VC (5636-2308		
	X	X	X	-	(S1) 86a (See Spares Under Motor Starter)							
						SWITCHES - CLASS 24						
X	X	X	X	1	(S1) 7	S P, 7 position, shorting type			CG	H-22291-HIC		SW-27
X	X	X	X	1	(S1) 39	2 Pole, 10 Position, 2 Sections						
						1 Two Gang			AR	Type 8012-B)		
						1 One Gang			AR	Type 8012-SB)		SW-67
X	X	X	X	1	(S1) 46	2 Pole, 5 Position			CG	23263-HIC		SW-57
X	X	X	X	1	(S1) 48	4 Pole, double throw			CG	23262-HIC		SW-70
X	X	X	X	1	(S1) 71	Double Pole, single throw			CD	Type 80600		SW-38
X	X	X	X	1	(S1) 92, (S2)71, (S4) 6	Single Pole, double throw			CD	Type 21350		SW-11
X	X	X	X	1	(S2) 13	3 Gang, 10 Position			CG	22290-H3C		SW-68
X	X	X	X	1	(S3) 2, (S4) 2	1 Single Pole double throw, 2 single pole single throw contact springs			HF	Type G2-3		SW-14
						VACUUM TUBES - CLASS 38						
X	X	X	X	10	(S1) 93, 94, 95, 96, 97	Transmitting Beam Power Tube			B	Type 807		
X	X	X	X	6	(S1) 98, 99, 100	Twin Triode Amplifier			B	Type 6A6		
X	X	X	X	4	(S1) 101, 102	Class "B" Triode			B	Type 809		
X				4	(S1) 115, 116	Rectifier			B	Type 866A/866		
X	X	X	X	8	(S2) 103, 104, 105, 106	Pentagrid Mixer Amplifier			B	Type 6L7		
X	X	X	X	2	(S2) 107	Duo Diode Triode (2nd Detector)			B	Type 6R7		
X	X	X	X	2	(S2) 108	Beam Power Amplifier			B	Type 6V6GT/G		
X	X	X	X	2	(S2) 109	Triode Amplifier Oscillator			B	Type 6J5		
X	X	X	X	2	(S2) 110	Full Wave High Vacuum Rectifier			B	Type 5W4		
						MISCELLANEOUS PARTS						
X	X	X	X	1	(S6) 1	4 Prong Mycalex Insulation			AS	4 Prong Spec.		SKT-6
X	X	X	X	3	(S6) 2	5 Prong Mycalex Insulation			AS	5 Prong spec.		SKT-11
X	X	X	X	2	(S6) 3	7 Prong Phenolic Insulation			AH	12-DNO		SKT-17
X	X	X	X	5	(S6) 4	8 Prong Ceramic Insulation			R	CIR		SKT-23
X				1	(S6) 5	4 Prong, UX, shell			AO	#210		
X	X	X	X	2	(S6) 6	For Rotating R. F. Inductors			A	------		
X	X	X	X	1 Set	(S6) 7 (1 Set of 5)	With #91 Alden Caps			A	------		
X	X	X	X	1 Set	(S6) 8 (1 Set of 2)	With #12 National Clips			A	------		
X				1 Set	(S6) 9 (1 Set of 2)	With #12 National Clips.			A	------		

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

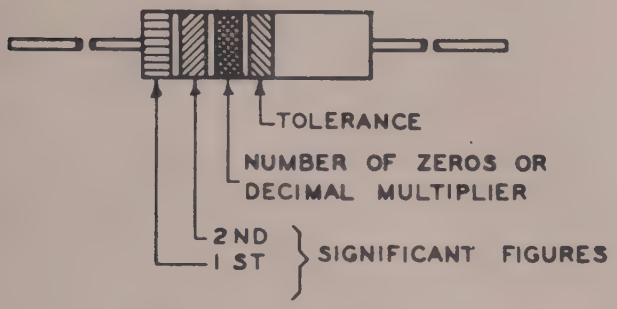
NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, table II.

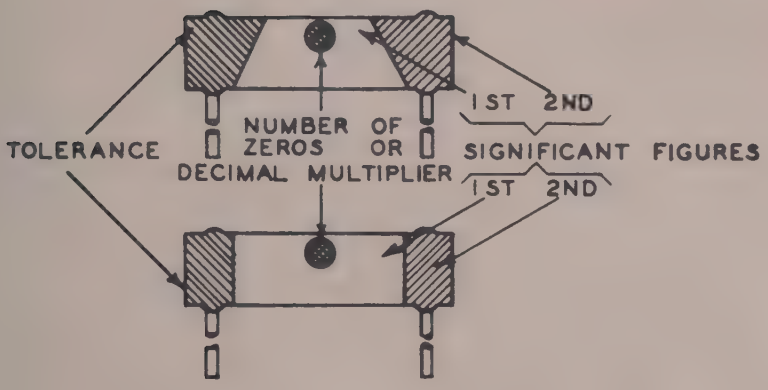
115 V AC	230 V DC	32 V DC	115 V DC	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS. & SPEC. NO.	MFR.	MFRS. DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. OR PART NUMBER
						MISCELLANEOUS PARTS (Cont'd)						
X	X	X	X	1	(S6) 10	4 Ft of 4 Conductor Cable			HF	H4J4		
X	X	X	X	1	(S6) 11	Lord Type 200-XPH-75			EN	200-XPH-75		
X	X	X	X	3	(S6) 12	Alsimag Insulator			P	1647		
X	X	X	X	1	(S6) 13	Alsimag Insulator			P	1005		
X	X	X	X	1	(S6) 14	Alsimag Insulator			P	S-1186		
X	X	X	X	1	(S6) 15	Cone Insulator			R	GS-10		
						TOOLS						
X	X	X	X	1	Spline Wrench	For Removing Handset Push Button			CW	RMCA		
X	X	X	X	1	Set Screw Wrench	For Allen Set Screw #8						
						SPARE PARTS BOX						
X	X	X	X	1	Spare Parts Box	For General Spares - Metal, 24" X 15" X 15"						
	X	X	X	1	Spare Parts Box	For Rotating Equipment - Metal, 18" X 21" X 12"						
X				1	Spare Parts Box	For Add'l A.C. Spares - Metal, 24" X 15" X 15"						

TABLE NO. V
APPLICABLE COLOR CODE AND MISCELLANEOUS DATA

U. S. NAVY

MODEL TCP-3 RADIOTELEPHONE EQUIPMENT





COLOR CODE

Color	Numeral or Number of Zeros	Decimal Multiplier	Tolerance
Black	0		-
Brown	1		-
Red	2		-
Orange	3		-
Yellow	4		-
Green	5		-
Blue	6		-
Violet	7		-
Gray	8		-
White	9		-
Gold	-	0.1	± 5 percent
Silver	-	0.01	± 10 percent
No color	-	-	± 20 percent

TABLE NO. VI
LIST OF MANUFACTURERS
MODEL TCP SERIES RADIOTELEPHONE EQUIPMENT

Reference	Name	Address
A	Radiomarine Corp. of America	75 Varick Street, New York, N.Y.
B	Radio Corp. of America, Victor Division	Front and Cooper Sts., Camden, New Jersey
C	Chase-Shawmut Company	Newburyport, Mass.
D	Littelfuse, Inc.	4757 N. Ravenswood Ave., Chicago, Ill
E	Struthers Dunn, Inc.	1321 Arch Street, Philadelphia, Pa.
G	International Resistance Co.(IRC)	403 N. Broad St., Phila, Pa
H	Continental Carbon Company	13900 Lorain Ave., Lorain, O.
I	Sangamo Electric Co.	Springfield, Ill.
J	General Electric Co.,	1 River Road, Schnectady, N.Y.
K	Teleradio Engineering Corp.	484-490 Broome St., New York, N. Y.
L	Ohmite Manufacturing Company	4835 W. Flournoy St., Chicago 44, Ill.
N	Kenyon Transformer Company	840 Barry St., New York, N.Y.
P	American Lava Corporation	Chattanooga, Tenn.
R	National Company	61 Sherman St., Malden, Mass.
S	Electric Specialty Company	Stamford, Conn.
AA	P. R. Mallory & Co., Inc.	Indianapolis, Indiana
AE	General Radio Company	Cambridge, Mass.
AH	Hugh H. Eby, Inc.	4700 Stenton Avenue, Phila, Pa.
AN	Allen D. Cardwell Mfg. Corp.	81 Prospect St., Bklyn, N. Y.
AO	E. F. Johnson Company	Waseca, Minn.
AR	Communications Products Co., Inc.	363 Cator Ave., Jersey City,N.J.
AS	Electronic Mechanics	Clifton, N. J.
AT	Clarostat Mfg. Co., Inc.	281-285 N. 6th St., Bklyn, N.Y.
AU	Allen Bradley Company	1309 S. 1st St., Milwaukee, Wis.
AW	John E. Fast & Company	3132 N. Crawford Ave., Chicago, Ill.
BF	Western Electric Company	300 Central Ave., Kearny, N. J.
BK	Cornell-Dubilier Elec. Corp.	South Plainfield, N. J.
BL	Bryant Electric Company	Bridgeport, Conn.
BO	Pioneer Gen-E-Motor Corp.	5831-49 Dickens Ave., Chicago, Ill.
BQ	Westinghouse Elec. & Mfg. Co.	40 Wall Street, New York, N.Y.
BZ	C. P. Clare and Company	Lawrence & Lamon Aves., Chicago, Ill.
CD	Hart and Hageman	Hartford, Conn
CG	Oak Manufacturing Company	711 W. Lake Street, Chicago, Ill.
CJ	Leach Relay Company	5915 Avalon Blvd., Los Angeles, Calif.
CS	Oxford Tartak Radio Corp.	915 West Van Buren St., Chicago, Ill.
CU	F. W. Sickles Company	Springfield, Mass.
CW	Hinckley-Myers Company,	Jackson, Michigan
CX	Solar Manufacturing Corp.	Bayonne, N. J.
DL	New Departure - Div. of General Motors	Bristol, Conn
EN	Lord Manufacturing Co.	Erie, Pa.
BM	Cornish Wire Co., Inc.	15 Park Row, New York, N.Y.

FIGURE 1

Transmitter-Receiver Unit,
Types CRT-43009-A, -43010-A, -43061 and -43062

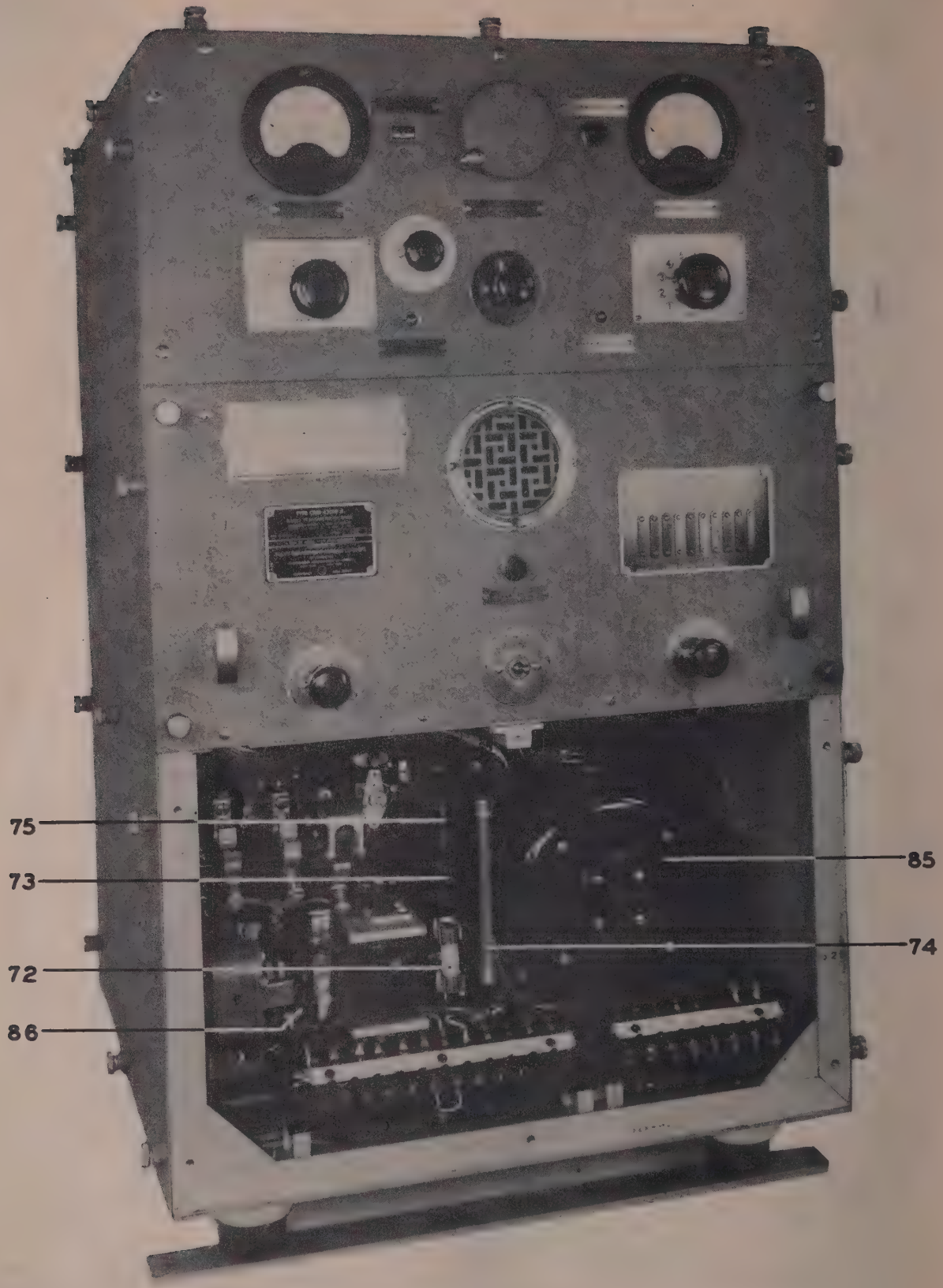


FIGURE 2

Transmitter-Receiver Unit - Lower Front Panel Removed,
Types CRM-43009-A, -43010-A and -43061

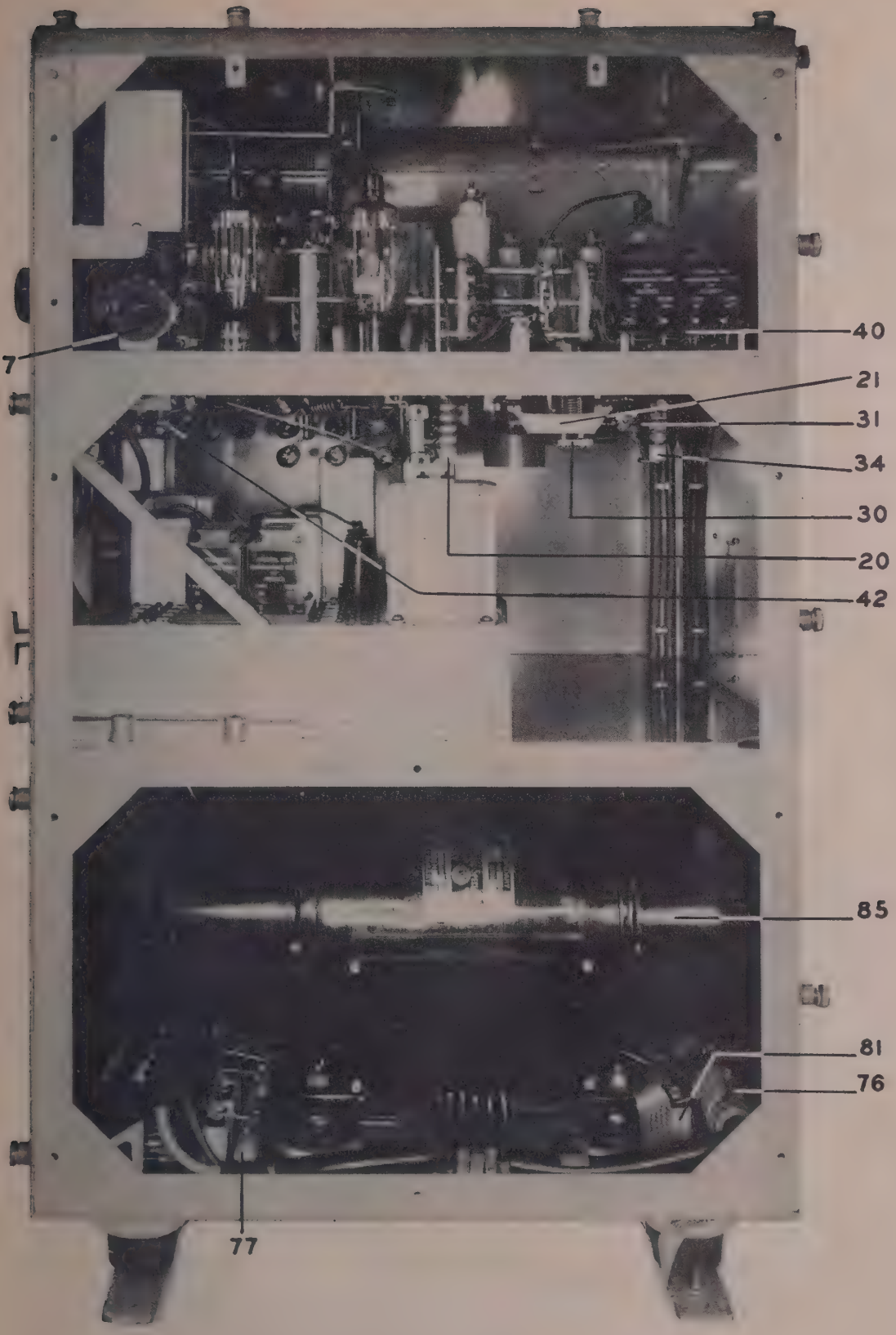


FIGURE 3

Transmitter-Receiver Unit-Right Side View-
Right Side Panel Removed,
Types CRM-43009-A, -43010-A and -43061

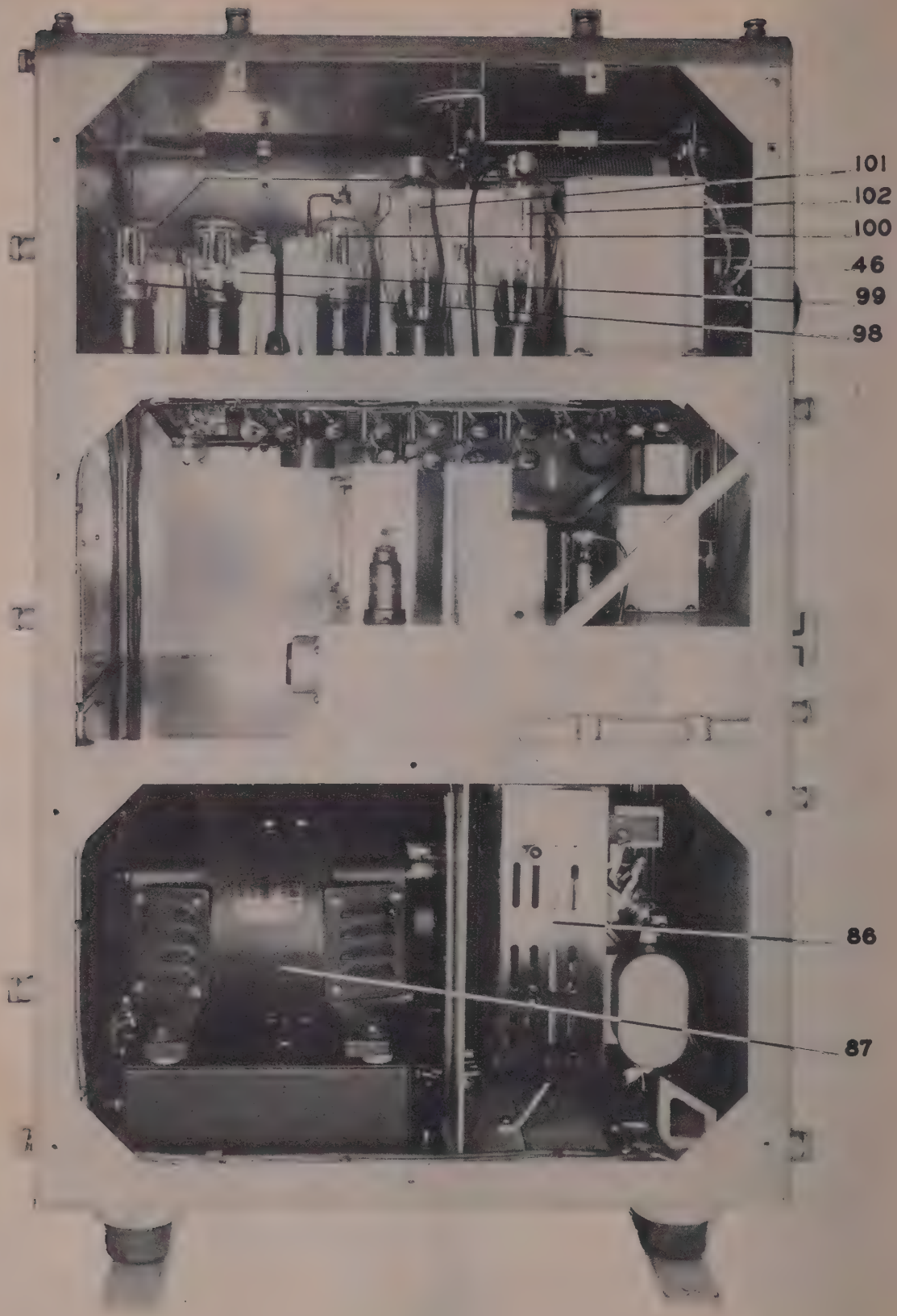


FIGURE 4

Transmitter-Receiver Unit-Left Side View-
Left Side Panel Removed,
Types CRM-43009-A, -43010-A and -43061

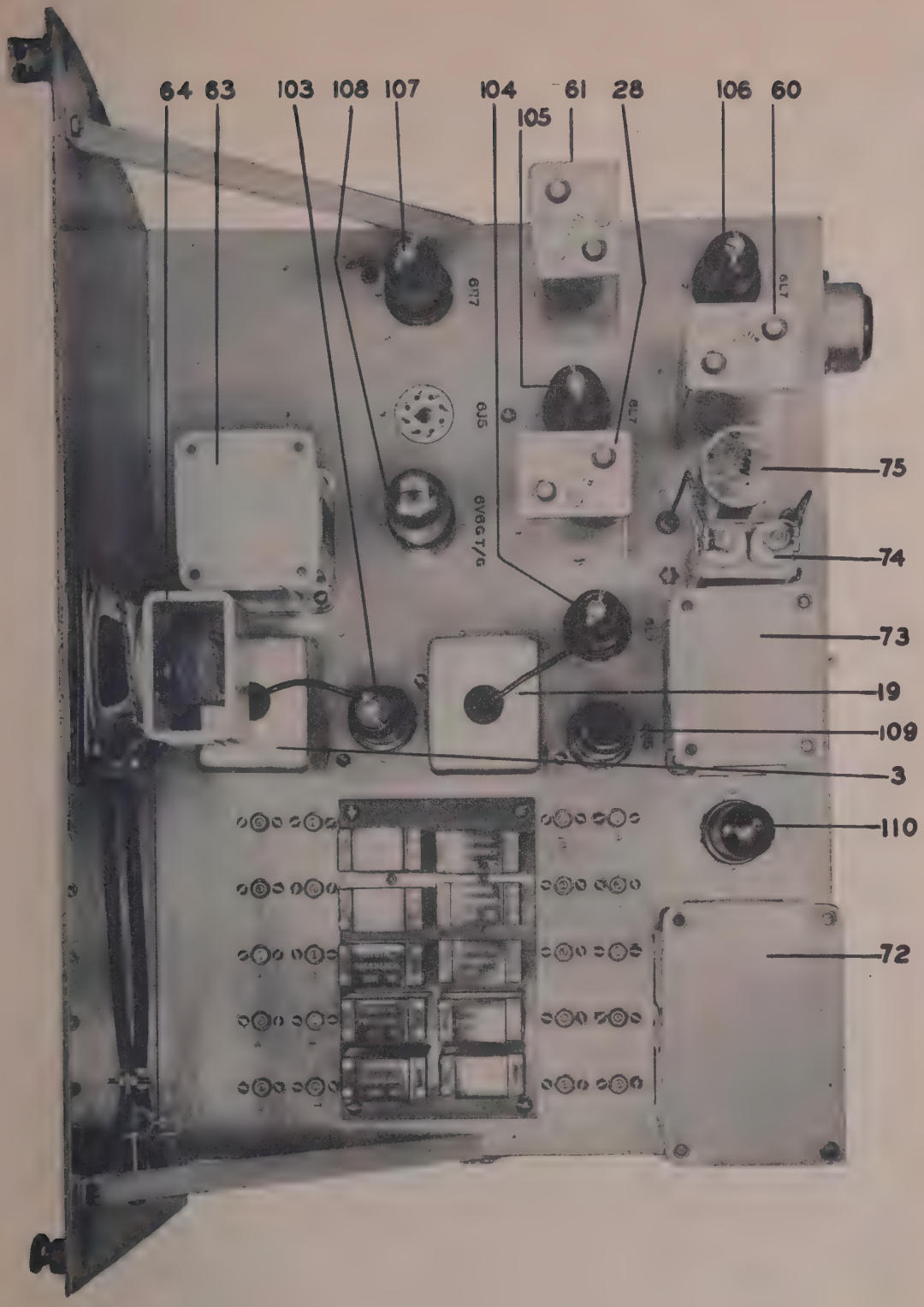


FIGURE 5

Receiver Chassis - Top View
Receiver Section of Types CRM-43009-A, 43010-A, -43061 and - 43062

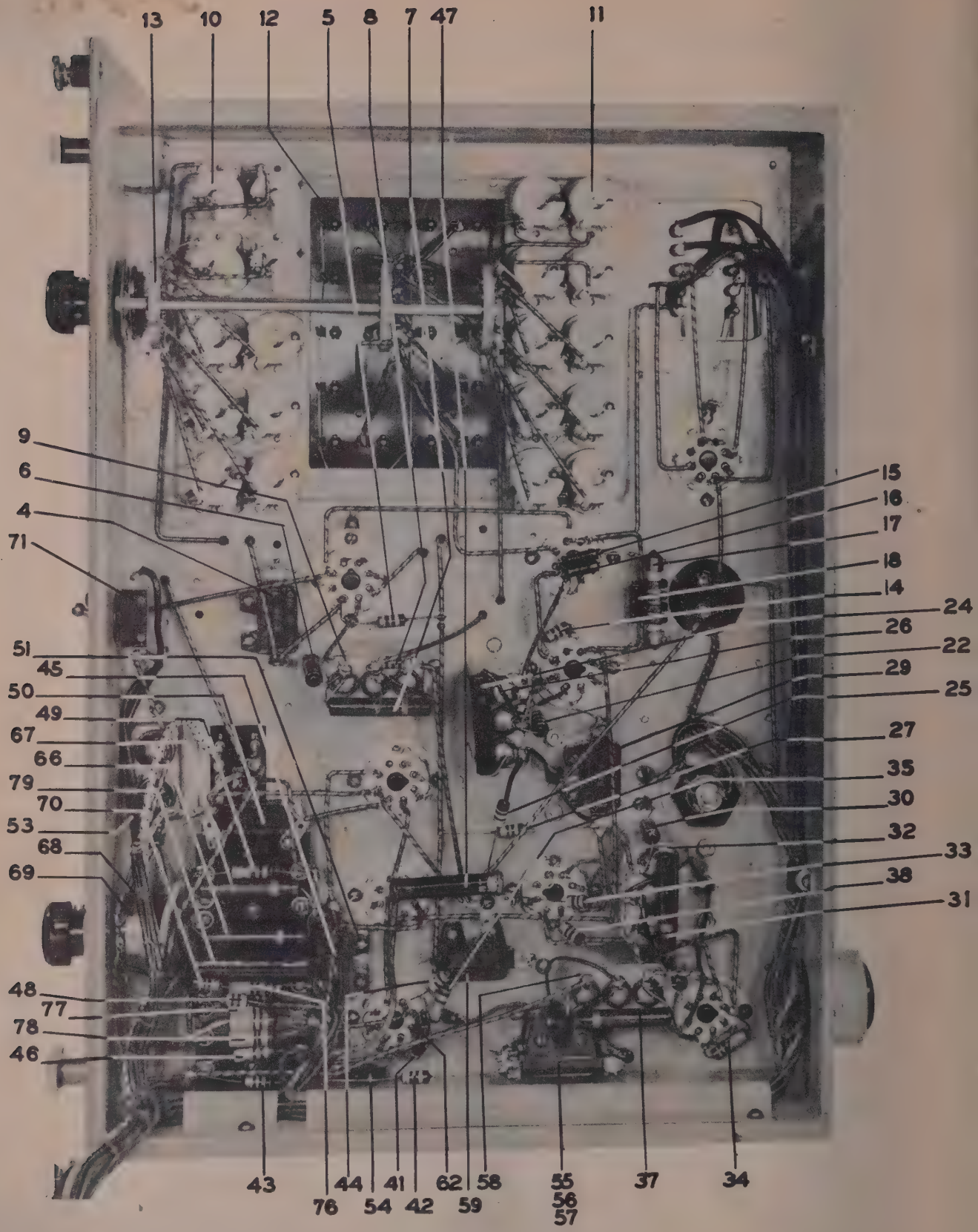


FIGURE 6

Receiver Chassis - Bottom View
Receiver Section of Types CRM-43009-A, -43010-A, 43061 and -43062

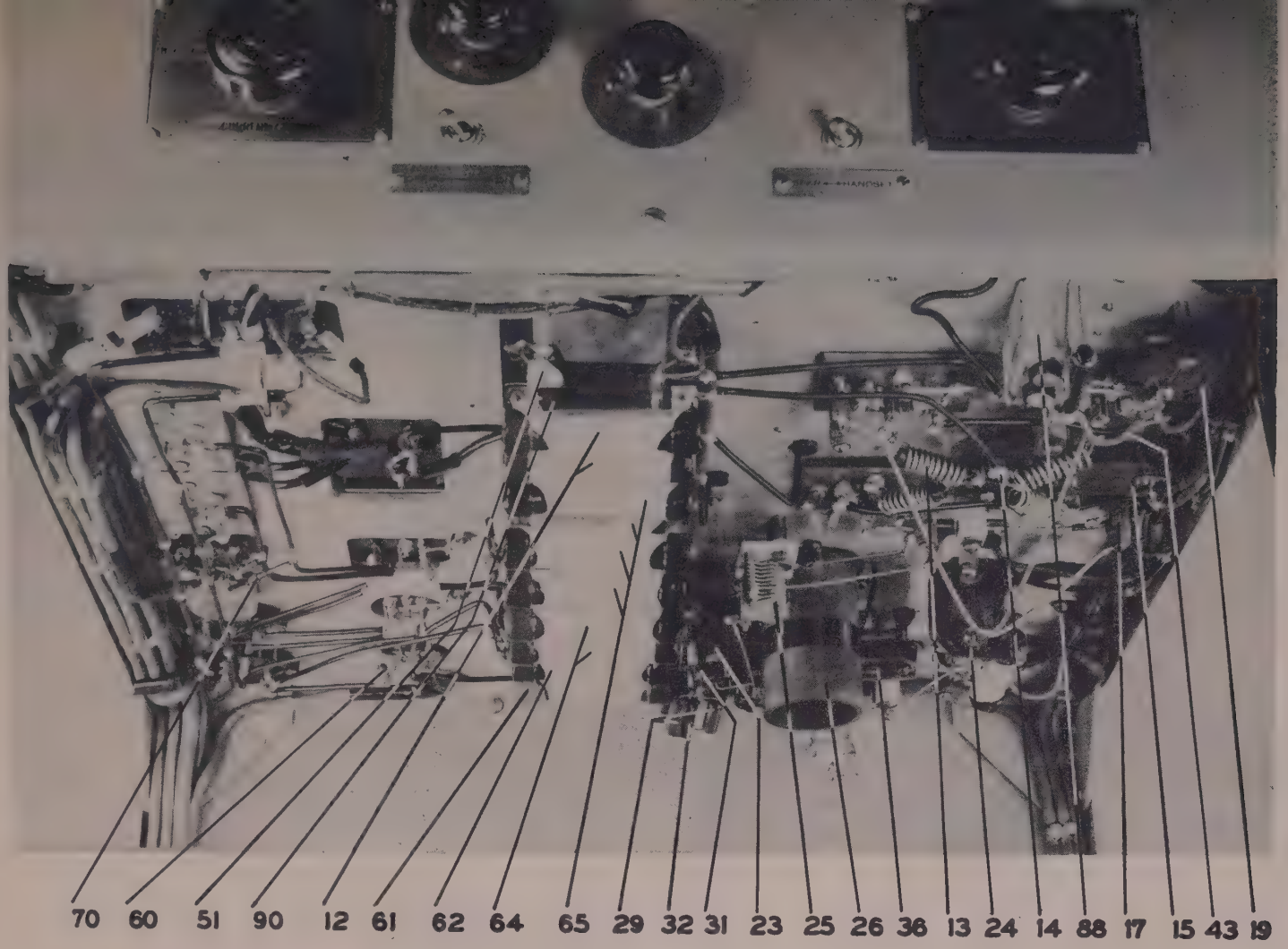


FIGURE 7

Transmitter Section-Bottom View with Receiver Removed,
Types CRM-43009-A, -43010-A, -43061 and -43062

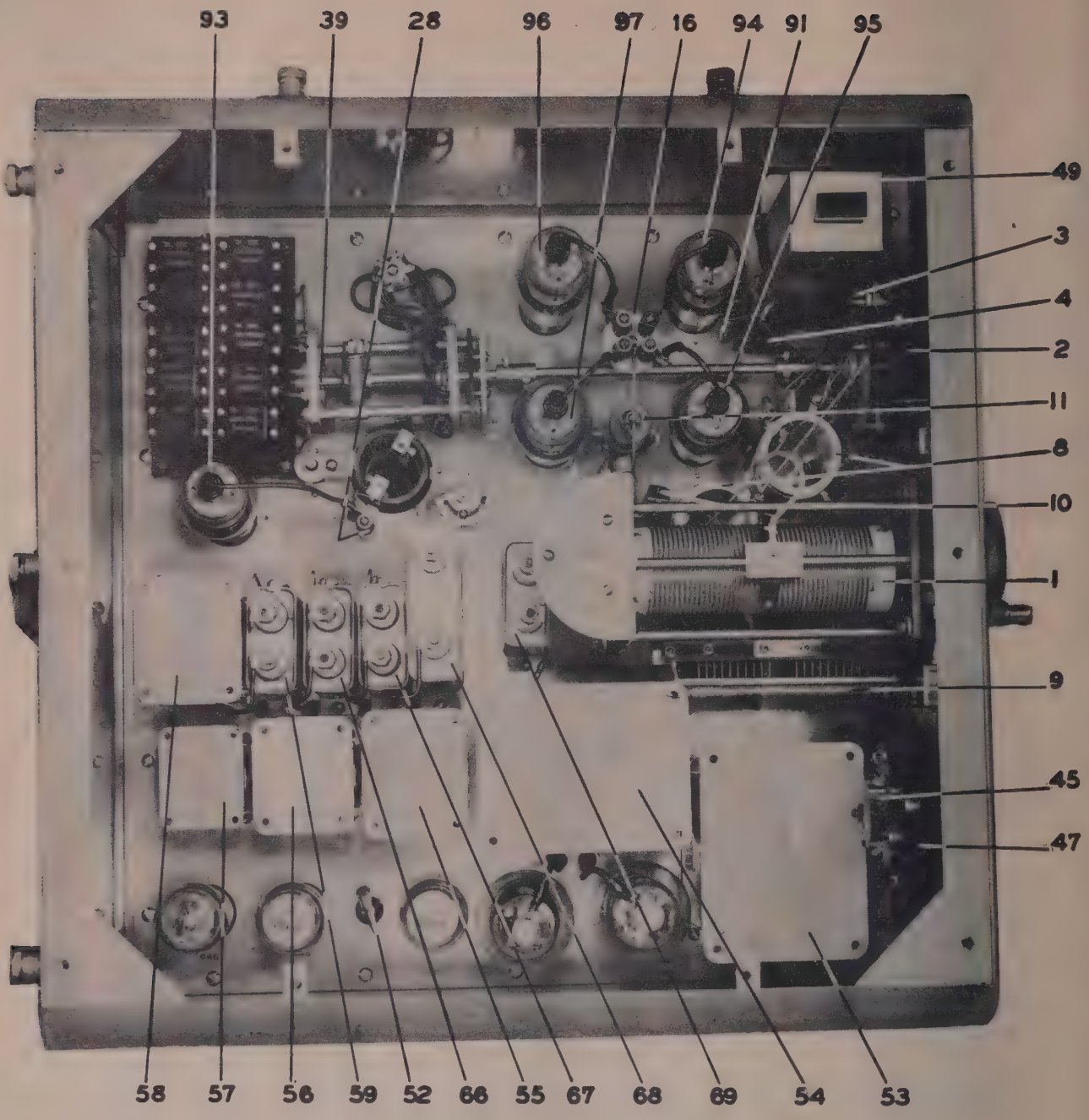


FIGURE 8

Transmitter Section-Top View-Top Cover Removed,
Types CRM-43009-A, -43010-A, -43061 and -43062

FIGURE 9

Hand Telephone Assembly,
Type CRM-51026

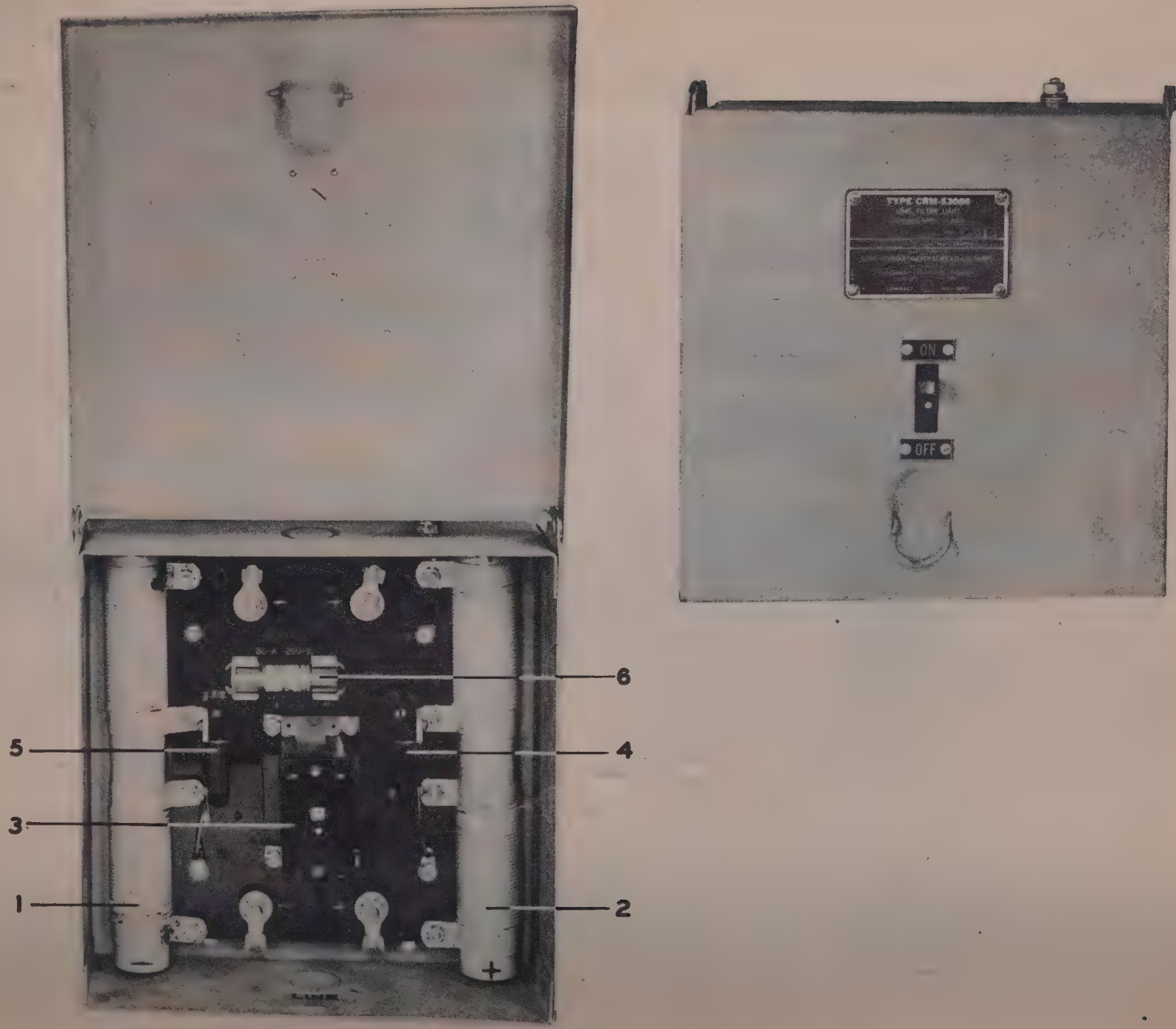


FIGURE 10
Line Filter Unit-Cover Open and Closed,
Types CRM-53085, -53086 and -53192

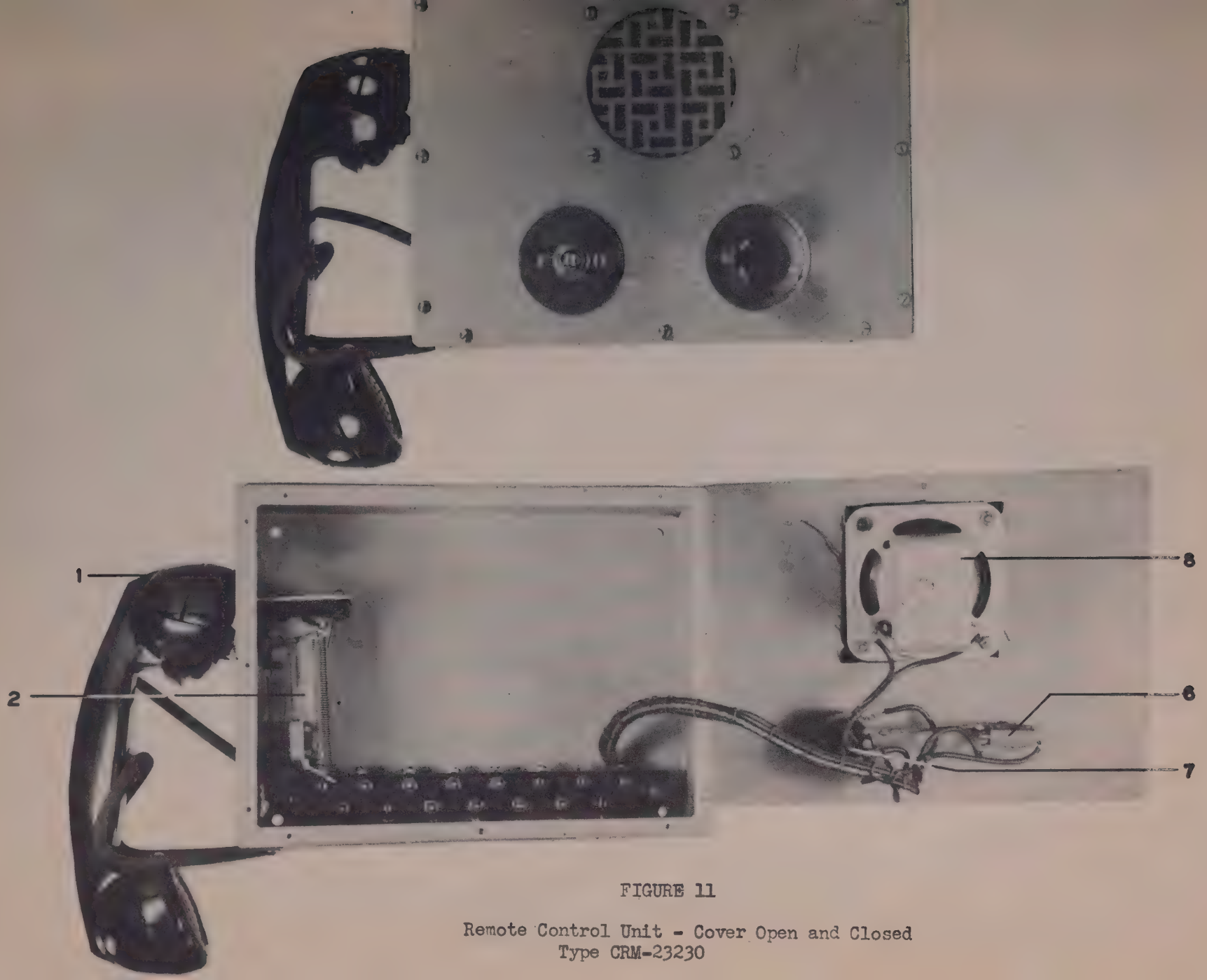


FIGURE 11

Remote Control Unit - Cover Open and Closed
Type CRM-23230

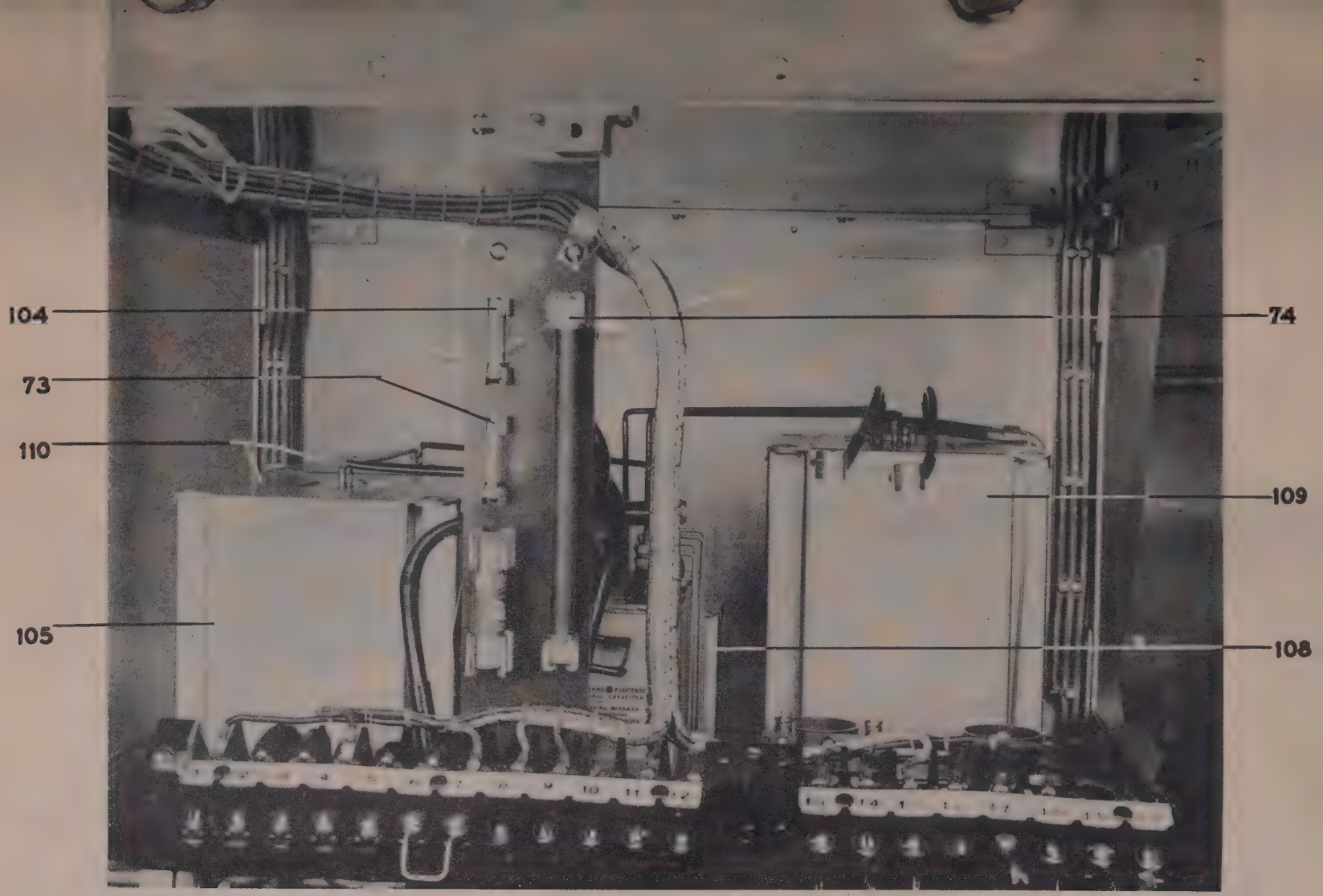


FIGURE 12

Transmitter-Receiver Unit-Transmitter Power Section-
Front View with Lower Front Panel Removed,
Type CRM-43062

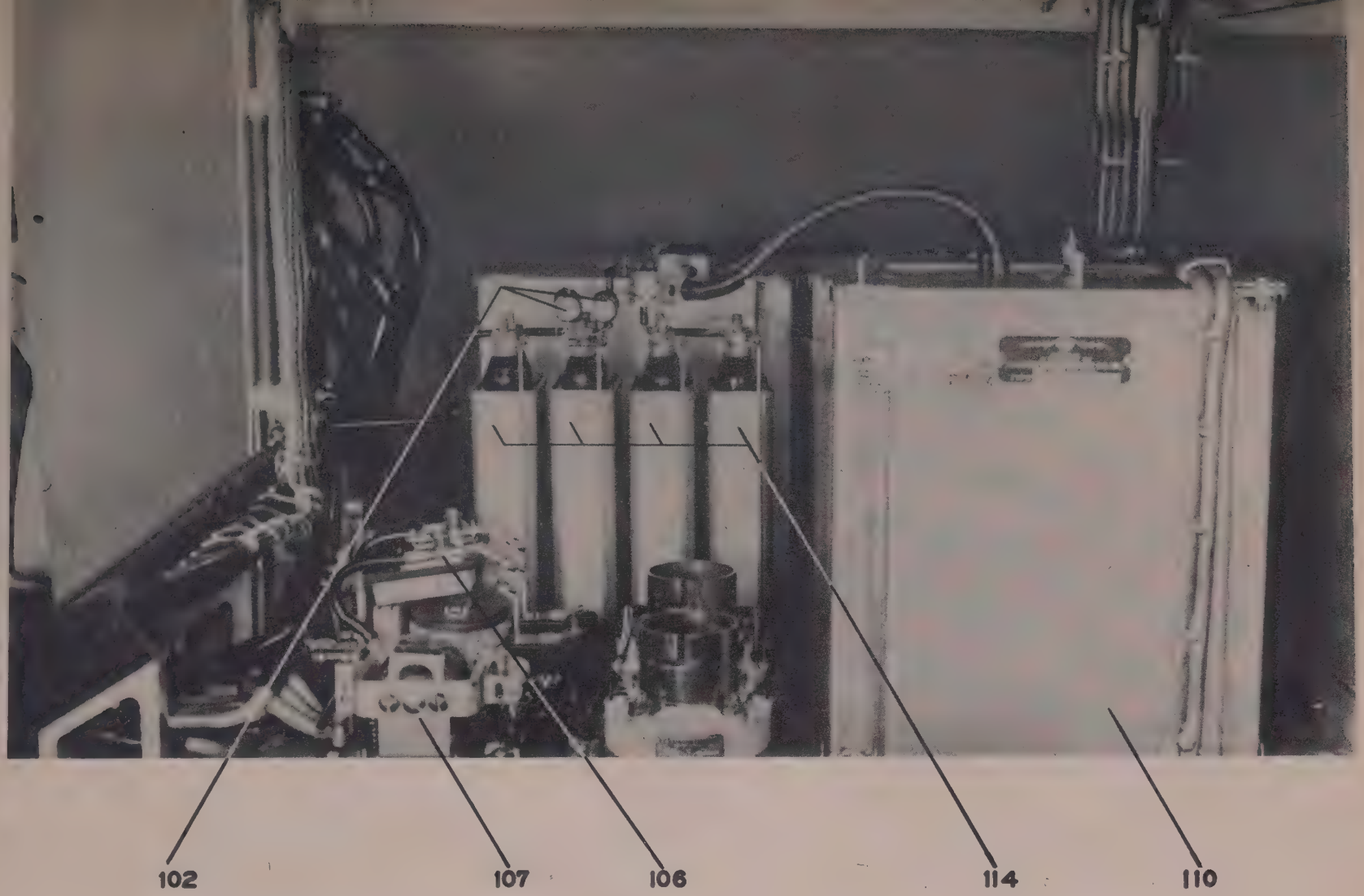
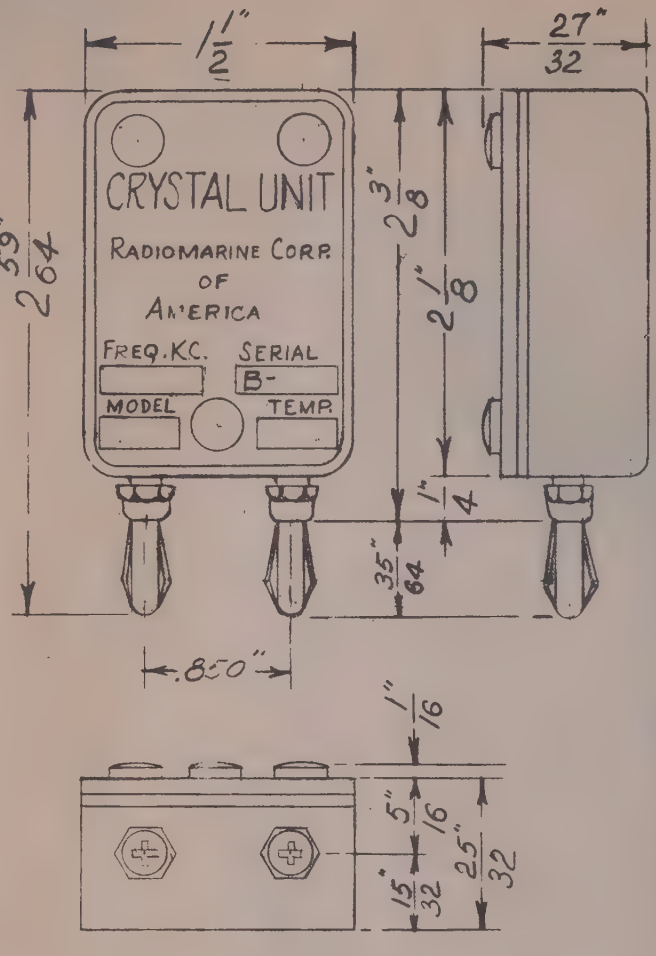


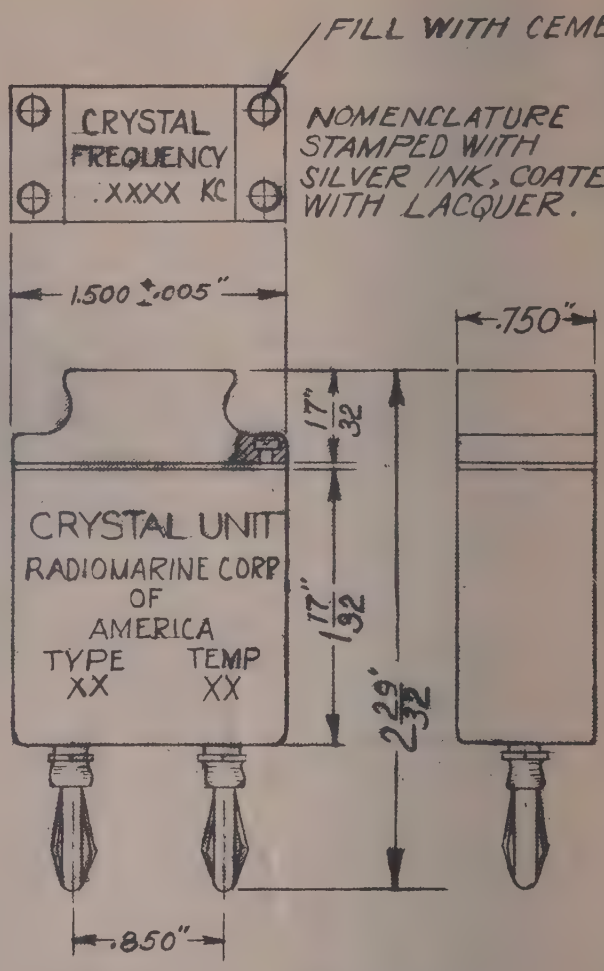
FIGURE 13

Transmitter-Receiver Unit-Transmitter Power Section-
Right Side View with Right Side Panel Removed,
Type CRM-43062



ALTERNATE TYPE R-1 & R-2 HOLDER

INTERCHANGEABLE MECHANICALY & ELECTRICALLY



RADIOMARINE TYPE	R-1	R-2
MAX. TEMP. COEFF. IN % °C.	.0003	.0003
CRYSTAL CUT, 2-4 MEGACYCLES	A	A
CRYSTAL CUT, 4-11 MEGACYCLES	B	B
CALIBRATION TEMP. °C	35	45

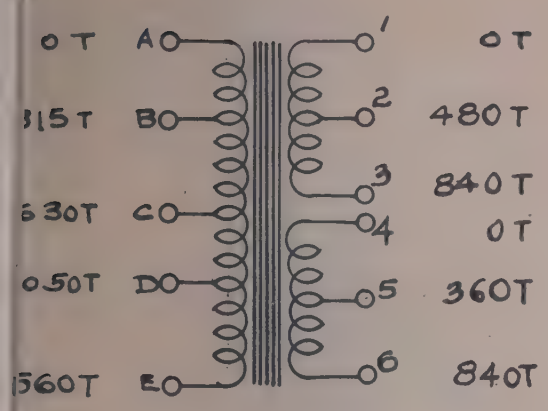
SUB #4. 1-31-44 M.R.

CRYSTAL HOLDER
RADIOMARINE TYPES R-1 & R-2

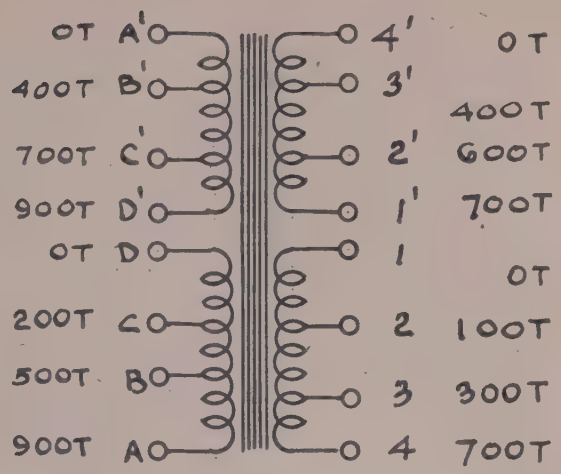
RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	F. MERKLER	KS-63
NEW YORK H Bm	Sub. 4	Date 1-27-44

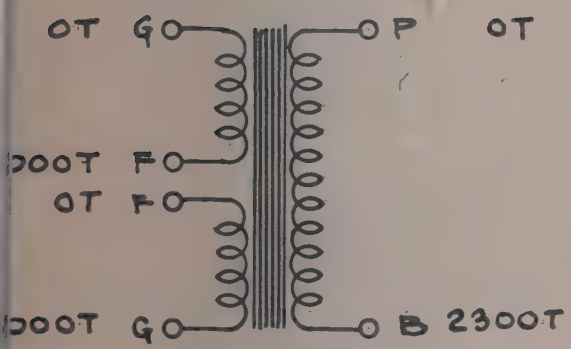
T-494 (54)



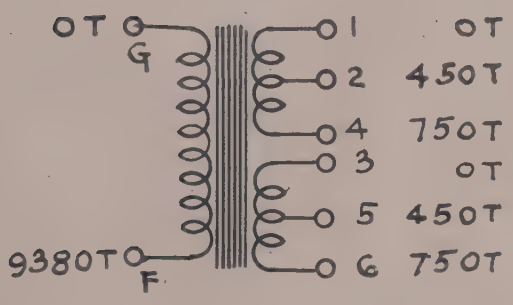
T-264 (55)



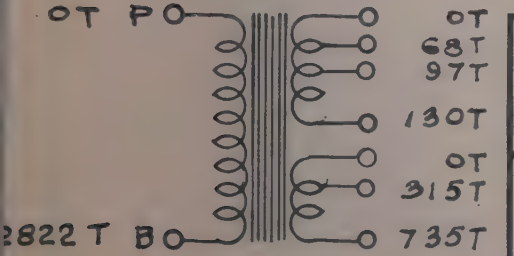
T-251 (56)



T-1 (57)



T-104 (63)



NOTE: NUMBERS IN BRACKETS ARE SYMBOL DESIGNATIONS ON SCHEMATIC DWGS. NUMBERS WITH "T" FOLLOWING INDICATE NO. OF TURNS

MODEL TCP SERIES-TRANSFORMERS
SCHEMATIC DIAGRAM

RADIOMARINE CORP. OF AMERICA

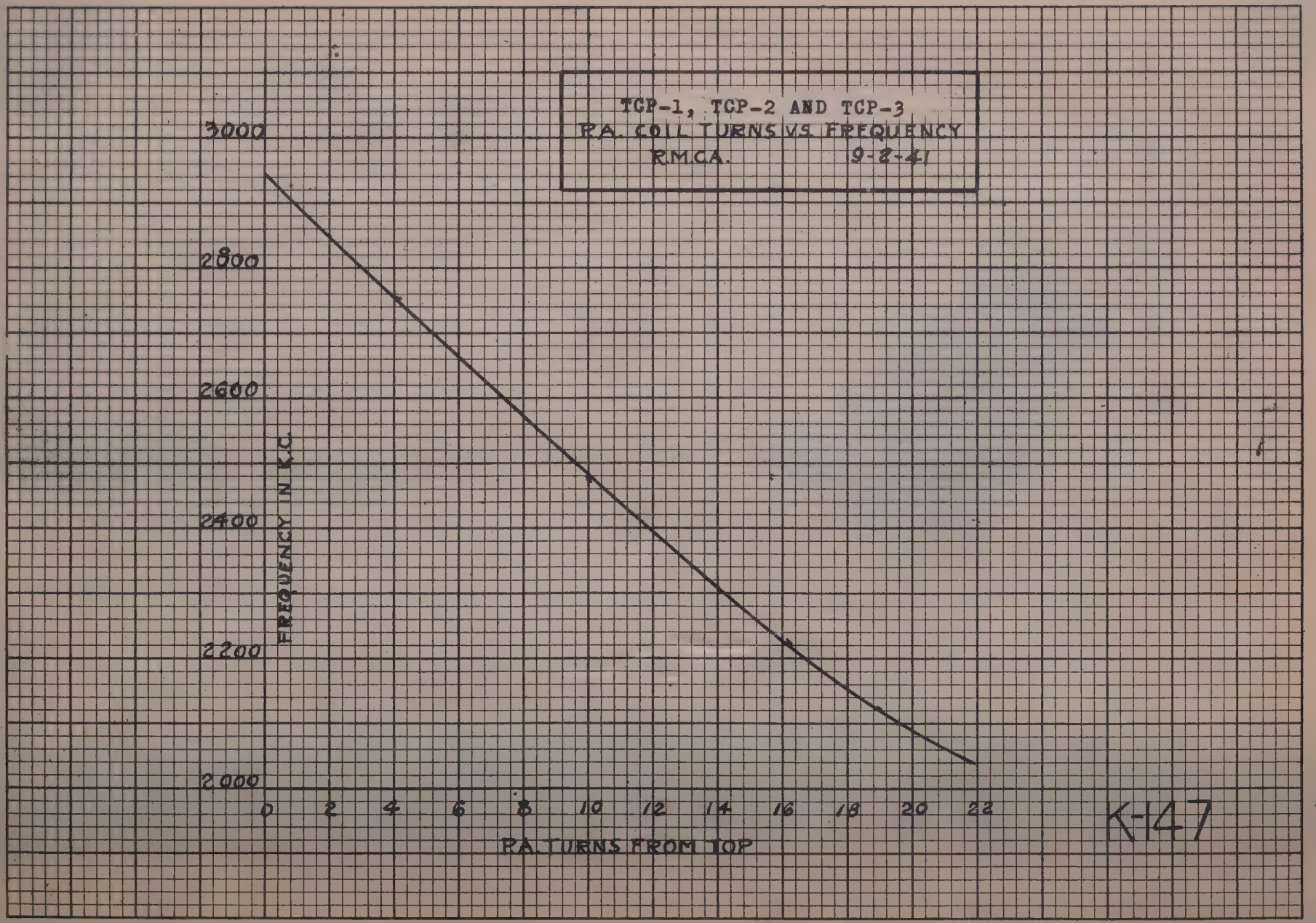
ENGINEERING DEPT. S.S.

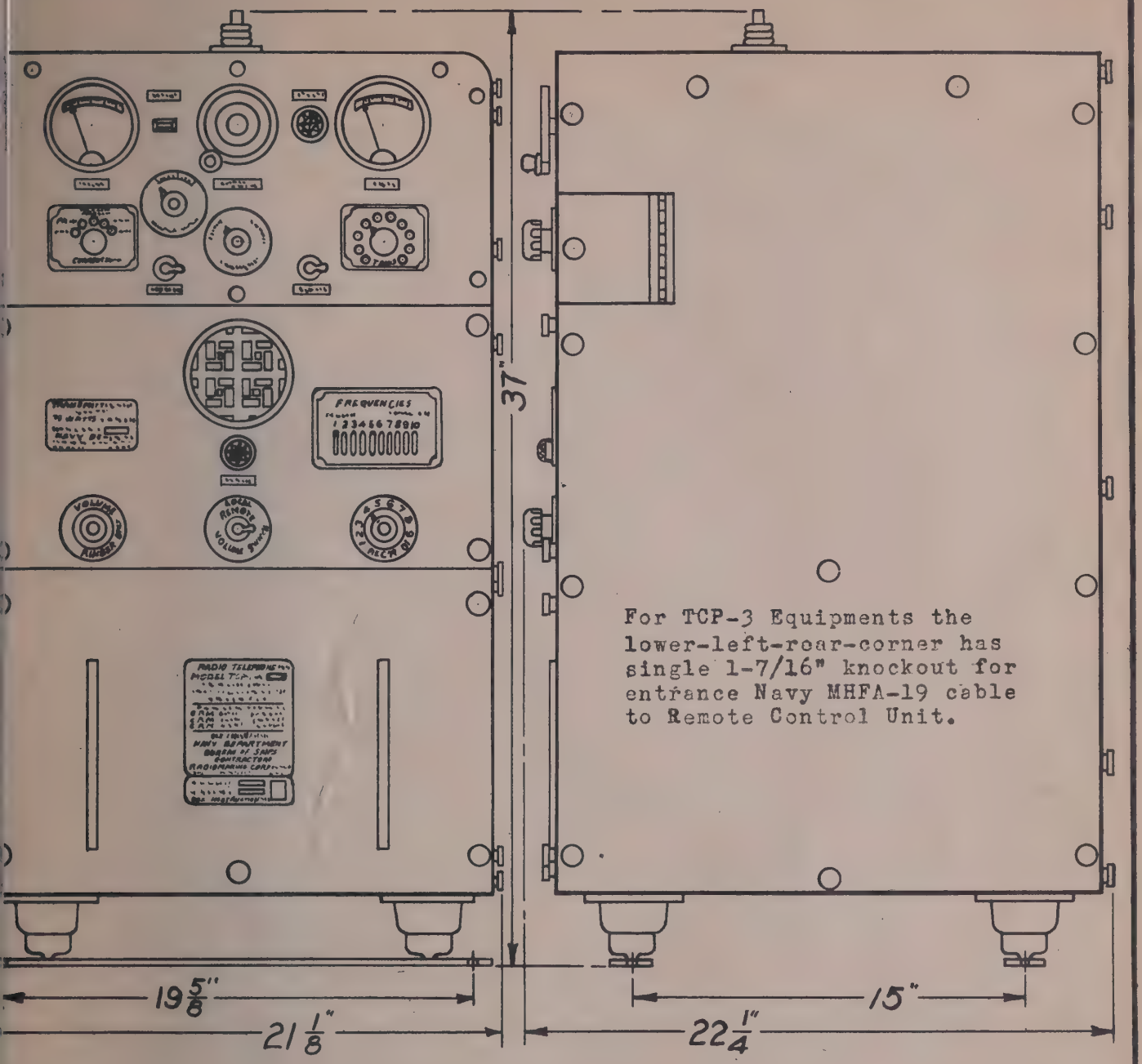
NEW YORK 9B Sub. 2

K-145

Date 10/17/41

SUB	DESCRIPTION	DATE	BY
2	CHANGED TITLE	10/9/44	S.S.
1	ADDED NOTE	10/29/41	S.S.


TCP-1, TCP-2 AND TCP-3
PA. COIL TURNS VS FREQUENCY
R.M.C.A. 9-8-41
3000
2800
2600
2400
2200
2000
FREQUENCY IN K.C.
0
2
4
6
8
10
12
14
16
18
20
22
PA. TURNS FROM TOP
K-147


FREQUENCIES
1 2 3 4 5 6 7 8 9 10
37"
For TCP-3 Equipments the lower-left-rear-corner has single 1-7/16" knockout for entrance Navy MHFA-19 cable to Remote Control Unit.
19 5/8"
21 1/8"
15"
22 1/4"

NAVY TYPE	POWER SUPPLY
CRM-43009-A	32 V DC
CRM-43010-A	115 V DC
CRM-43061	230 V DC
CRM-43062	115 V AC

WEIGHT = 310 LBS.

Sub 2-Title-10/10/44
SUB #1 5-542 S.R

TRANSMITTER-RECEIVER UNIT
CRM-(*)
A UNIT OF MODELS TCP-1, 2 AND 3 RADIO EQUIPMENTS

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.

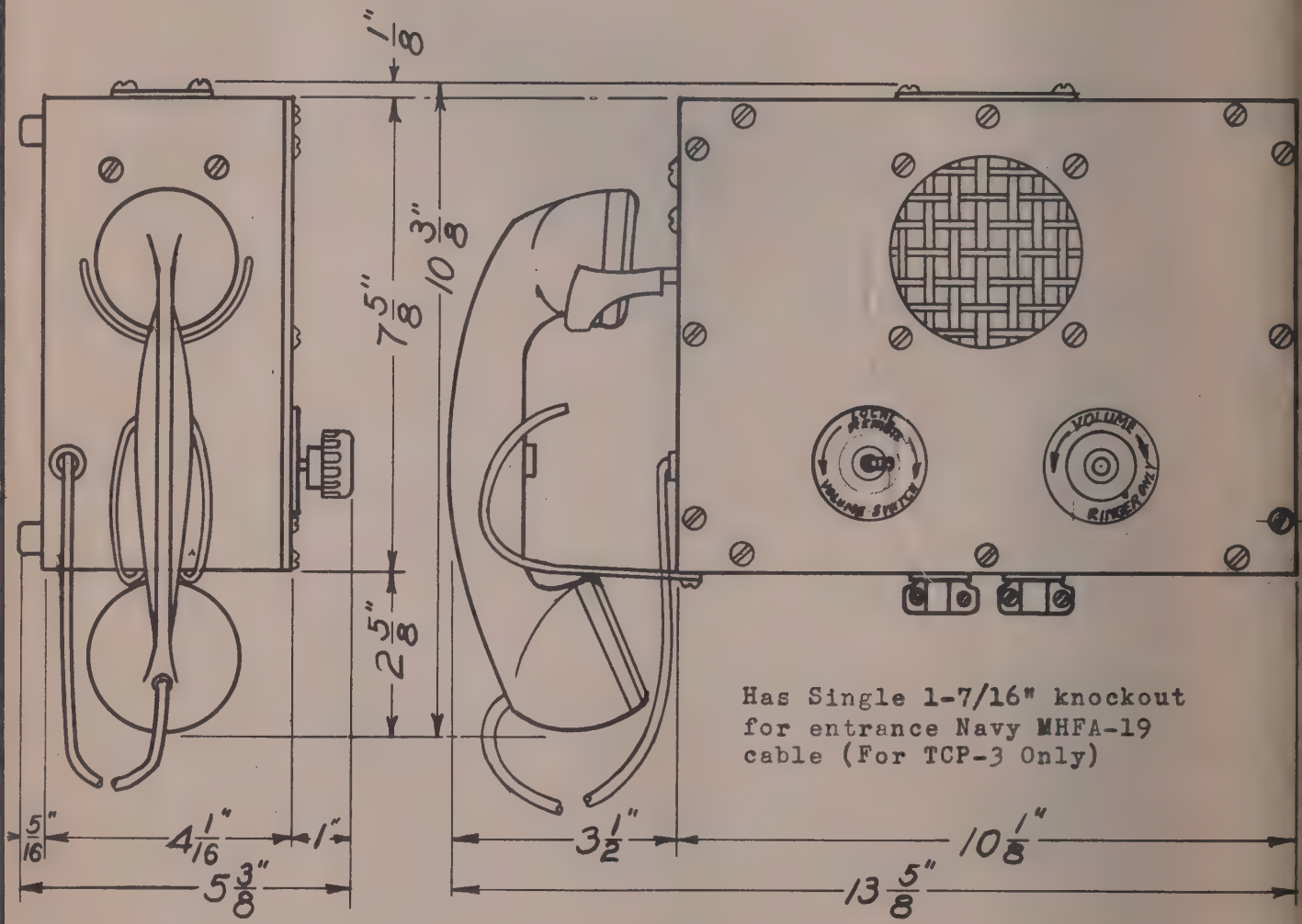
NEW YORK

M.F.R.

Sub. #1 2

KS-12

Date 6-27-41



REMOTE CONTROL UNIT
CRM-23230
FOR USE WITH MODEL TCP SERIES RADIO EQUIPMENT

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	M.F.R.	K-S-13
NEW YORK	Sub. 1	Date 6-27-41

WEIGHT - 11 LBS

Sub 1-Title-10/10/41

HAND TELEPHONE ASSEMBLY
CRM-51026
A UNIT OF MODEL TCP SERIES RADIO EQUIPMENT

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.
NEW YORK

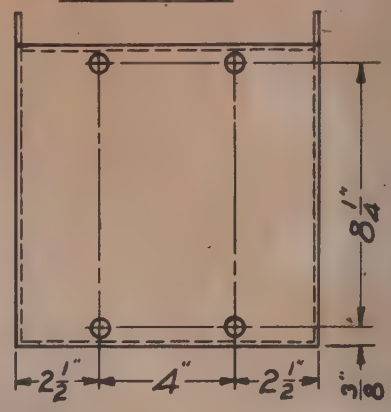
M.F.R.
Sub. D 1

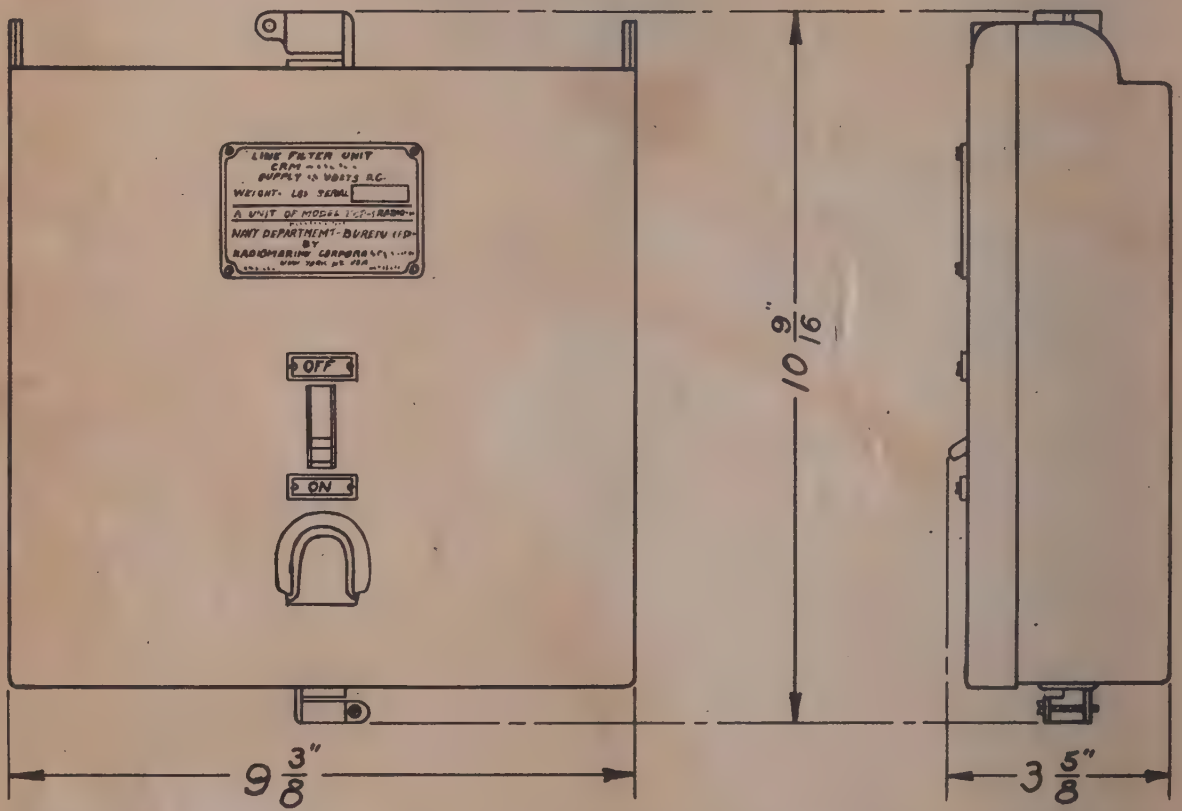
KS-14
Date 6-27-41

WEIGHT = 4 LBS

Sub. 1-Title-10/10/44

REAR VIEW
SHOWING DRILLING FOR
MTG. HOLES





* NAVY TYPE	POWER SUPPLY
CRM-53085	32 V DC
CRM-53086	115 V DC
CRM-53192	230 V DC

WEIGHT - 9 LBS

Sub 1-Title-10/10/44

LINE FILTER UNIT
CRM-(*)
A UNIT OF MODELS TCP-1, 2 AND 3 RADIO EQUIPMENT

RADIOMARINE CORP. OF AMERICA

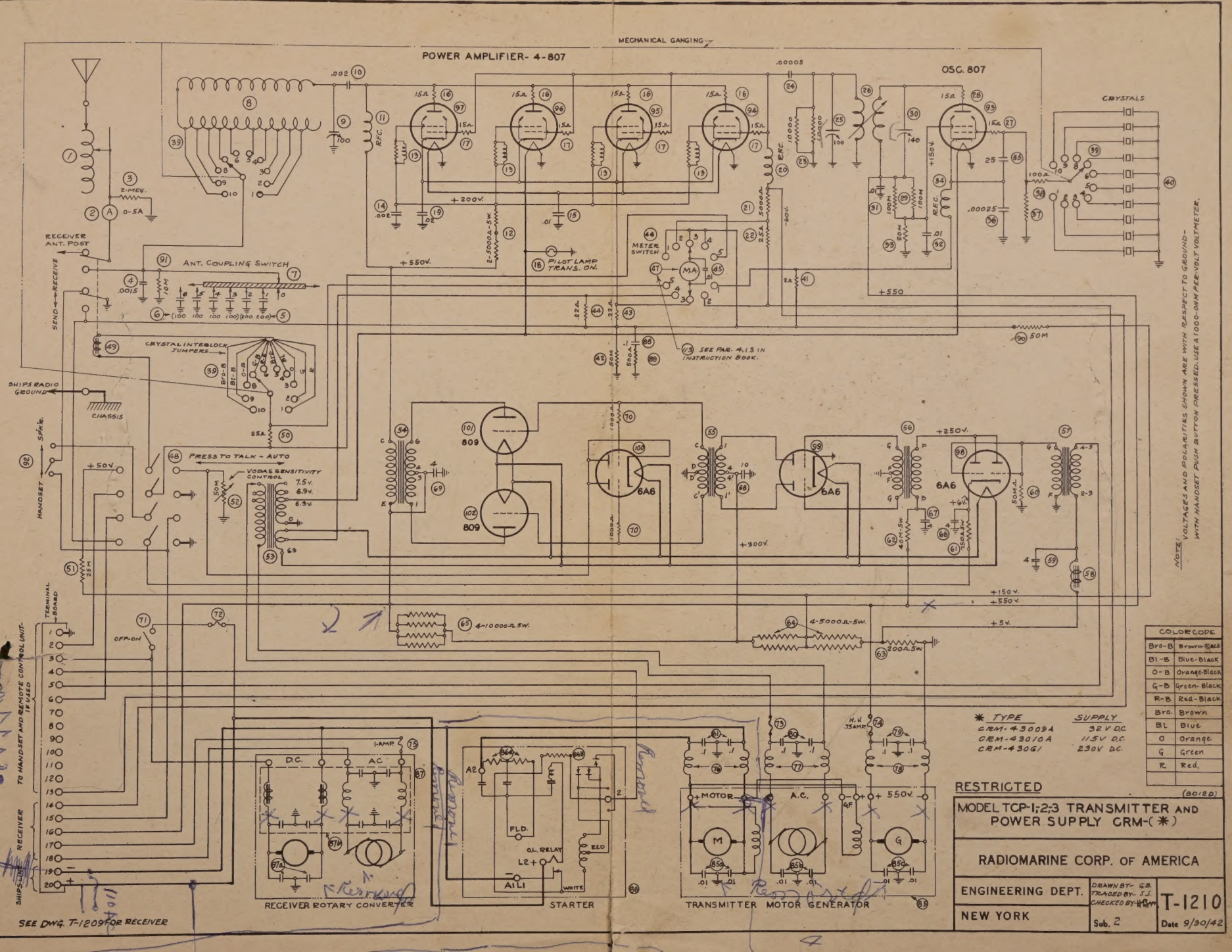
ENGINEERING DEPT.
NEW YORK

M.F.R.

Sub. 1

KS-15

Date 6-27-41



NOTE: VOLTAGES AND POLARITIES SHOWN ARE WITH RESPECT TO GROUND — WITH HANDSET PUSH BUTTON PRESSED. USE A 1000-OHM PER-VOLT VOLTMETER.

COLOR CODE	
Bro-B	Brown-Black
Bl-B	Blue-Black
O-B	Orange-Black
G-B	Green-Black
R-B	Red-Black
Bro.	Brown
Bl	Blue
O	Orange
G	Green
R	Red.

* TYPE
CRM-43009A
CRM-43010A
CRM-430G1

SUPPLY
32 V D.C.
115V D.C.
230V D.C.

RESTRICTED

(80-12D)

MODEL TCP-1;2;3 TRANSMITTER AND POWER SUPPLY CRM-(*)

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	DRAWN BY- G.B. TRACED BY- J.J. CHECKED BY-	T-1210
NEW YORK	Sub. 2	Date 9/30/42